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March 5, 1921

Popocatepetl in Eruption

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By Graham John Mitchell

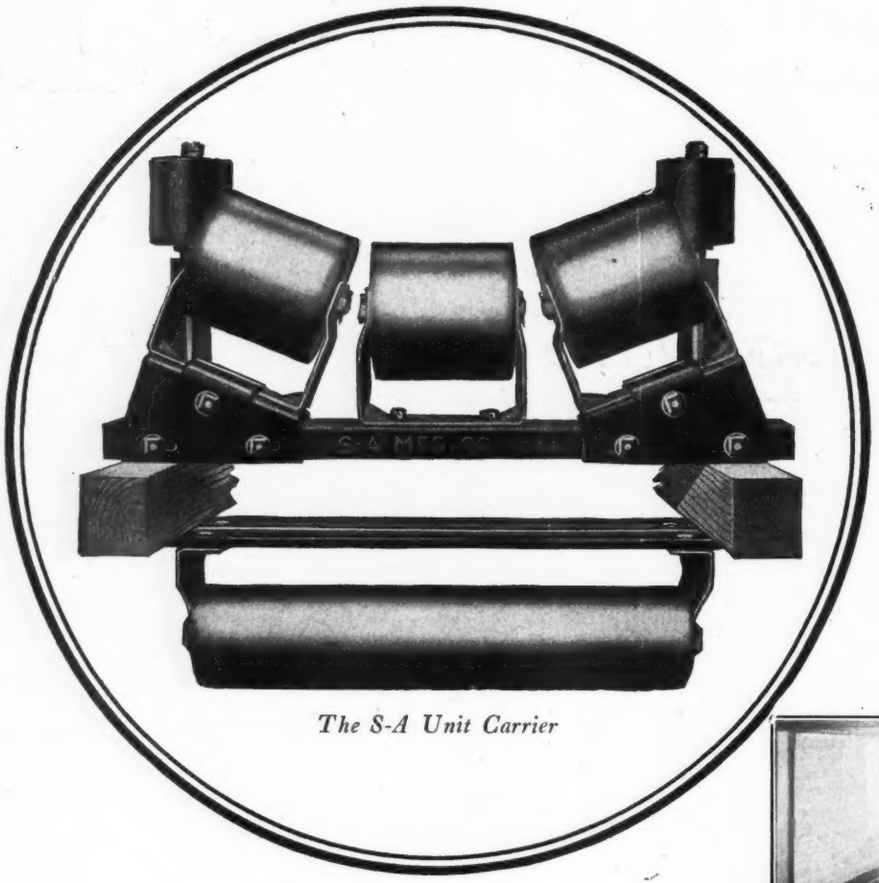
Industrial Development of Zinc

By Stephen S. Tuthill

Biographical Sketch of

H. A. Guess

Metallurgist and Mine Executive



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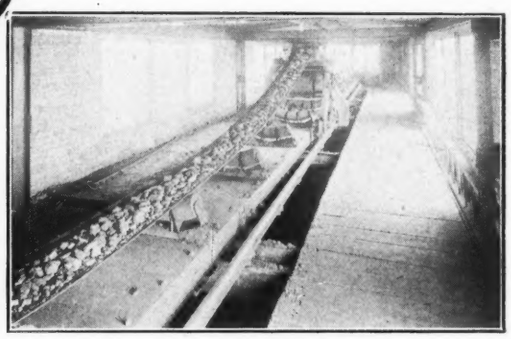

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Volume 111 **New York, March 5, 1921** *Number* 10

The Swinging Pendulum

"WHEN the devil was ill, the devil a monk would be." But when the old boy recovered he forgot his good resolves. With this as text the labor agitator has ammunition enough to work up a sermon of strong appeal to the workingman, even though his analogy and deductions be entirely wrong. To support his argument he need only quote from the report of the Institute's subcommittee on industrial relations, presented at the recent meeting. "Today," says this report, "it is estimated that the average reduction in wages of the non-unionized classes is about 24 per cent from the early high point of 1920, and the downward trend is in full progress. The labor unions have not yet fallen in line, but they cannot long hold off the inevitable. The efficiency is increasing day by day. *Already the hastily undertaken welfare schemes are being dropped, and despite the hollow protestations of many to give a 'square deal,' old and trusted employees are being laid off.* The law of supply and demand remains inexorable. The pendulum has swung back; employers are again masters of the situation."

Words are winged. This blanket indictment is unfortunate. The facts should have been given. If the sentence in italics (our own italics) be untrue, it better had never been written. If it be true, then there is something rotten in the mining industry, for this is practically a charge of hypocrisy against the operators who have "hastily undertaken welfare schemes." Obviously, the great mining corporations who have long devoted much time and money to industrial relations work are not included, but one may rest assured that the soap (or dynamite) box orator will not make this distinction.

To what extent, then, have welfare schemes been dropped and old and trusted employees laid off? Most operators, large and small, have been forced to curtail or suspend. The small company compelled to close is hardly likely to continue its welfare work, nor will the workman object, for, his pay check stopped, he is looking elsewhere. The larger producer, in most cases in a more or less permanent camp, is continuing his welfare program, for he knows that present conditions are but temporary and that it will pay in the long run.

We doubt that old and trusted employees are wantonly being laid off. Good business dictates otherwise. News from all districts during the last few months indicates that operators are seeking to effect curtailment and at the same time keep their organizations together. But when business crises come, even the trusted employee may have to go, for what other course is open, the millennium being not yet arrived? He will usually be the last to go, however.

The pendulum has indeed swung back, and the employers are once more the "masters" of the situation, as the committee says. It is well that all bear in mind, however, that the pendulum's swing continues, that the struggle between capital and labor is not over, and that the lamb and the lion, or rather the lion and the tiger, are not yet ready to mix on equal terms. More than once agitators have said that welfare schemes had been forced on operators, that they denoted fear on the latter's part rather than sincere good will, and were evidence of what the unions had done for labor. The company today that drops its welfare program because it feels that now it once again is master, helps to convince the workingman that the agitators spoke correctly, and the cause of organized labor is thus strengthened.

We are going through the reconstruction period heralded and looked forward to during the war. Mining companies now have an excellent opportunity to establish good relations with their men on a firmer basis than ever before. Wielding the big stick will give only a temporary advantage, and be repented of later. Recently, at Butte, operators and union representatives met, and the latter were told that oppressive working rates must come down or the companies would break with the unions for good. Experience has shown that labor at Butte needs curbing, and the attitude of the operators seems justified. But the latter will do well to remember that the pendulum will again swing back, as it has in the past, and that folly now will mean extra trouble then.

Mining Versus Engineering

THE LIFE of a mining engineer is divided among his business or professional duties (his work), his personal or domestic relations, his relaxation and social relations, his duties and functions as a citizen, and his group ties and duties. By the last we mean his co-operation and team work as a unit of those groups of men with which he is naturally most affiliated. The all-round man makes a proper balancing of his time, money, work, and loyalty among all of these. No longer can he live on such a simple daily schedule as "eight hours for work, eight hours for play, eight hours for sleep." His schedule, considered week by week, or month by month, or year by year, will become more and more complicated as he ascends in the scale of life.

For the moment, we wish to dwell on the group ties and duties. Take yourself as a typical mining engineer, and submit your affiliations to logical analysis. That is something which is done all too rarely. As your title indicates, your profession is a combination of two callings—mining and engineering. You practice engineering as applied to mining. Right here two distinct affiliations are discovered. Are you more engaged and interested in the calling of mining or in that of engineering? Some of our readers, after consideration, will indicate the latter; but by far the great majority will decide for the former.

There are several organized national mining groups which claim your affiliation and participation. To put it briefly and epigrammatically, there are the *American*

Institute of Mining and Metallurgical Engineers, which represents the engineering of mining; the *American Mining Congress,* which represents the politics of mining; the *Mining and Metallurgical Society of America,* which represents the policies of mining. We believe these definitions will be, and indeed have been, practically recognized and accepted by the societies in question. Also there is the *Society of Economic Geologists,* which represents the geology of mining. From a consideration of these four national mining societies, it is relatively easy for each to determine what phases of mining thus represented merit his interest and support, and in what degree. Of these four societies, the first and in a way the fourth are engineering societies; they represent the technology of mining. The second and third do not concern themselves with engineering problems properly speaking, and so are not essentially engineering societies, although the third is composed exclusively, and the second to a very considerable degree, of engineers.

So much for the mining groups. Of the engineering groups there are a number, especially the Four Founder Societies, comprising, besides the mining engineers, the civil engineers, the mechanical engineers, and the electrical engineers. Also, there are the chemical engineers, represented by the American Chemical Society. All these are tied together in interest, not so much by occupation as by class: they represent the application of various sciences to various industries, and are affiliated by reason of these facts, although the industries in which they labor are very diverse. Recently two successful attempts have been made to co-ordinate and combine the engineers into central organizations working more efficiently, the American Association of Engineers, which has many thousands of members, and whose object is primarily the economic welfare of the engineer members, and so has something of the aspect of a union; and the Federated American Engineering Societies, which aims to make effective the judgment and influence of the engineer as a citizen.

Your representation as a member of the engineer group is, therefore, well organized and co-ordinated. Your representation as a member of the mining group is also well provided for by the societies mentioned, but the central co-ordinated organization of this group has not yet been properly effected. There are signs that this is coming, however, as indicated by the appointment of certain co-ordinative committees, and the clearer general conception of the situation.

We cannot help feeling that the mining engineer is closer to the mining group than to the engineer group, lives more with his industry than with his class; and, therefore, that the mutual understanding and close co-ordination of the organizations representing the former group is, if anything, more vital to him than in the case of the latter.

International Use of "Engineering and Mining Journal" Quotations

FREQUENTLY letters and advices come to our office from out-of-the-way places of the earth requesting information about the market quotations for various metals and minerals, a circumstance that significantly denotes the widespread use of *Engineering and Mining Journal* quotations. This tendency has been especially marked of late when copper and other ores and mattes have been shipped to this country for reduction and refining from the four corners of the globe, necessitating some basis for equitable settlement not subject to exchange fluctuations. From North and South America to Africa the story is practically the same—shipments on *Engineering and Mining Journal* quotational settlements.

We have noted the regular appearance in the pages of *The Metal Bulletin,* of London, a tabulated list of *Engineering and Mining Journal* average prices for the major metals, attesting to the interest attached in metal-market circles abroad to our own quotations.

Hoover in the Cabinet

WE SALUTE the new Secretary of Commerce, Herbert C. Hoover. In a fog of political backing and filling, his appointment shines as a beacon of hope to a people harassed and distressed by the vacillation and incompetence of their misrepresentatives at Washington. Hoover measures up to the job; and no other man in the Republic possesses in so exceptional degree the confidence and love of his fellow citizens. His opportunity for great constructive service is without limit.

Hoover will have the country solidly behind him. The President-Elect has in this appointment at least consulted no other interest than the public welfare.

"Only a Correspondence School Mining Engineer"

SOME TIME AGO we used this phrase in an editorial, and were promptly taken to task for it by several correspondents, one or two of whose letters we published. As we looked over their letters, we agreed entirely with the points that they made—that the school did not make the engineer, that many graduates of engineering schools were worthless until they had had practical experience and training, that some high-class mining engineers had had little or no engineering school training; and that the initiative shown by a man who took a correspondence school course was some earnest of his character and, therefore, of his ultimate ability. Certainly we could agree with them in their contention that to be a correspondence school mining engineer was not necessarily to be labelled incompetent.

However, after due reflection, we submit the following evident facts: The personal character of a man, his energy and mental capacity, determine largely his worth and career. That is the natal difference between man and man. We have observed, for example, a man of the negro race vainly striving at college to assimilate the sciences, battling against an infinitely ancient unfavorable line of ancestry. Nevertheless, he went back home more quickened than if he had never seen the inside of a university.

In other words, the engineer is neither the man nor the training alone, but the man plus the training. The best engineer is the combination of the best man plus the best training. That the training is an essential part needs no arguing: or that the schools of mining engineering represent the best and most approved method of intensive training that assembled modern thought has been able to advise. If this were not so, we should need no mining colleges, no universities—no schools at all, in fact. Our correspondents will see to what unwarranted conclusions their generous thought will logically lead them.

Unquestionably, therefore, a correspondence school,

shorn of the intimate personal contact and adequate laboratory training, is, it goes without argument, inferior to the real mining school. Where one can point out a case where a man who has thus been educated finally excels, one can find a dozen instances where men instructed by means of the correspondence course have simply acquired thereby that little knowledge which is a dangerous thing. Therefore, the correspondence school mining engineer as a class (and eliminating the variable element of the man) is altogether inferior to the mining engineer trained in the institution where he must give all his time and personality to his task, and where his teachers give him the benefit of personal contact. If the man who takes a correspondence school course shows initiative which foretells eventually a good engineer, what shall we say of the initiative which impels a man to devote his entire time for years to the task? The mining schools are full—very full—of men who have worked to get there, and many of whom break off in their course to spend a year or so in work, that they may accumulate money enough to finish.

The recognition of the schooling as an essential part of education—which is indeed axiomatic—may be easily and logically followed further, to the recognition that the highest example of the "regular" mining schools turns out, as a class, men who will be, in the end, better mining engineers than those who attend inferior schools. Otherwise, there would be no sense in mining schools striving for excellence or a high standard.

The reader who has thought thus far along these lines may well extend his reflections as to what a mining school should be, what are the best schools and why, and what the less desirable ones. We are much interested in this vital problem, and hope later on to take it up more carefully.

Where Copper Products Cost Less Than Iron

WE MAY have been too conservative, after all, in a recent issue, in suggesting that copper screening should not sell for more than 5 or 6c. per square foot instead of 15c., when iron screens were 4c. Our Berlin correspondent, as mentioned in the *Engineering and Mining Journal* of Feb. 12, states that "experience has conclusively proved that the cost of manufacture for copper and copper-alloy parts is in almost every case lower than for parts made of any other material, particularly of iron." Small screws, he says, can be made more economically of brass than of iron. High labor costs are the chief reason, copper and brass being easier to work. Can any of our readers imagine anything made of copper selling for less than its iron counterpart in this country?

So far, we have heard of no active campaign to reduce these prices nor to investigate if and why they are too high. The Copper and Brass Research Committee will no doubt give the subject its close attention. It is something which should not be delayed until business becomes good again, but which demands immediate action.

Some of the London journals continue to belittle the efforts of the American copper producers in widening their market: *The Metal Bulletin*, for example, saying editorially in its issue of Jan. 25 that producers should have perceived the folly of demanding "famine prices" (18 to 19c.) last year without appointing a research committee to discover it. We do not think that copper has at any time been held at unjustifiably high prices, and, furthermore, since the price was reduced, less of it has been sold than when the price was higher. The demand has simply been absent at any price. However, the price of manufactured copper does seem too high. In widening the uses of and the demand for copper the committee has a big field, and one that will afford it ample opportunity to justify its existence.

Unwise Legislation

AN ATTEMPT is being made to legislate the oil industry of California into the class of public utilities by the present Legislature of the state. Of the several bills which have been introduced, one of the shortest, an Assembly bill, provides that:

"Every corporation, individual, or association of individuals, now or hereafter engaged in this state in the business of producing, refining, buying and selling or transporting crude petroleum or any of its products (except for its, his or their own use) is hereby declared to be a public utility, and shall be subject to the jurisdiction, regulation and control of the railroad commission of the State of California, and shall be subject to the provisions of this act and to all the provisions of the act of the Legislature of the State of California known as the Public Utilities Act approved Dec. 23, 1911, and of the acts amendatory thereof and supplementary thereto, which are in their nature applicable to the regulation of the public utilities herein created, where not in conflict with any of the provisions of this act."

Although the oil industry serves the public in a no uncertain way, it lacks many of the characteristics which determine a public utility. Power, light, telephone, water, and transportation are in themselves industries that serve the public, and in California operate under specific regulations prescribed by certain commissions. The petroleum industry of California is essentially a mining industry, highly organized, it is true, but operating now under the law of supply and demand. Presumably if it were to become a public utility, prices for crude petroleum and for the market products obtained therefrom would be subject to price control and regulation. It is difficult to see how this could be done.

Production of crude petroleum is sustained only by energetic action of the companies. Refining and marketing have been stabilized and standardized as much as circumstances will permit, but production depends upon individual incentive, business courage, and a relatively large capital account. New discoveries reward only a portion of the energy and capital expended. Without crude petroleum there would be no refineries, nor marketing, nor gasoline and lubricating oils. Valuation of oil lands is uncertain and at best extremely approximate.

Individual incentive is one of the most potent factors that have operated to build up our mining industry. Excessive regulation—and the mining industry has a good deal of regulation now, both state and Federal—will operate to curtail individual incentive, and in the long run the public will pay. Low-priced petroleum, and cheap copper, lead, and zinc are the direct result of the operation of the law of supply and demand. The public has benefited. The experiences of the war and of the post-war period prove the fallacy of price control.

We hope that these bills will die in committee, as they represent the excrescences of a narrow element bent upon forcing their extreme views upon a state already burdened with many commissions and a huge annual tax.

WHAT OTHERS THINK

The Difficulties of the Consolidated Arizona Smelting Co.

Referring to your editorial in the issue of Jan. 29, entitled "Cheap Copper Hard on Yavapai County," I certainly appreciate the kindly reference to myself and my management of the affairs of the Consolidated Arizona Smelting Co., but I think you are not quite fair to Yavapai County, and naturally you have not been conversant with the special troubles of the Consolidated Arizona Smelting Co.

As to Yavapai County—you will surely recall that it contains the United Verde and United Verde Extension, two of the greatest and most profitable copper mines in the country, and there are several smaller mines, which, under normal conditions, hold a modest place among the ranks of steady and profitable producers.

As to the Consolidated Arizona Smelting Co., from the first of 1915 until the end of 1919 this company produced thirty-four million pounds of copper from its own mines, the Blue Bell and De Soto, and the net cost of production, after crediting gold and silver, was 15c. per pound. Certainly we could not claim to be among the most favored or the largest copper producers; yet considering the fact that much of this copper was produced with an extremely inadequate and inefficient equipment, and the remainder at a time when general operating costs were extremely high, the record would make it appear that your statement that "Copper had to go to 30c. per pound before the company paid its first dividend" is rather misleading.

The fact was that the company was heavily in debt at the beginning of 1915, that its mines were badly underdeveloped, and that it possessed an obsolete and almost useless equipment at mines, mill, and smelter. The earnings of the company, beginning with the first of 1915, were used, first, to pay a part of the debt and to replace and rebuild the plant, for which latter purpose $1,800,000 was required; also, dividends were paid, all from earnings; but, unfortunately, the company never did get out of debt, and when the Government returned about six million pounds of copper at the end of 1918 (some of which was custom copper purchased on the basis of 26c. per pound), the subsequent forced sale of this material at the low prices of the spring of 1919 reduced its value by approximately $500,000.

Since then the company has struggled to get back on its feet, but copper-market conditions were unfavorable, and the last drop of 6c. per pound from September to December of 1920, coupled with some financial troubles of a peculiar nature, made the struggle hopeless.

Personally I have believed and still believe that if this company can be reorganized on a sound financial basis, free from debt, and with proper funds provided for working capital and for mine development, it can continue to produce its own copper with profit for a number of years, and although I agree that there is no chance for custom business with 12c. or even with 15c. copper, I am convinced that before the price returns to 20c. many other properties will open up, and that our custom business can again be made as extensive and profitable as it was during the last five years, and that among the prospects of Yavapai County several more real mines will be developed.

G. M. COLVOCORESSES.

Humboldt, Ariz.

The Iron Cap Mill in 1920

In his article on Arizona in your Annual Review number of Jan. 22, Mr. Mitke is good enough to give the Iron Cap mill (completed during the year) favorable mention, calling attention to a recovery at times averaging over 90 per cent. There is an unintentional error in this statement which I would like to correct.

The Iron Cap mill was completed and started in operation in June, 1920. It operated steadily until curtailment of production became necessary in November. It is operating on about one-third time now, is making concentrates having a round-number average of 30 per cent copper, 30 per cent insoluble, and 30 per cent iron from a siliceous ore containing approximately 100 lb. of copper per ton (8.4 lb. of which is in an oxidized or acid soluble state) with a recovery that often exceeds 95 per cent, and has not been as low as 90 per cent for a single day since the mill was started. The average recovery for 1920 was 93.5 per cent of the total copper content of the ore handled.

DAVID COLE.

El Paso, Tex.

The Legal Status of Oil-Shale Deposits

In the letter of Leroy A. Palmer, under the heading of "The Legal Status of Oil-Shale Deposits," in *Engineering and Mining Journal* of Feb. 5, Mr. Palmer states that the width of lode claims in Colorado is 150 ft. on each side of the lode line. He is way out of date, as in 1913 the Legislature amended the law, so that except in the counties of Gilpin, Clear Creek, Boulder, and Summit, the claims are the full size allowed by the Federal laws, namely, 300 ft. on each side of the center line. In the four counties named, the width is 150 ft. on each side of the center line.

The present Legislature is considering a bill to make the width in these counties the same as in the rest of the state.

HORACE F. LUNT.

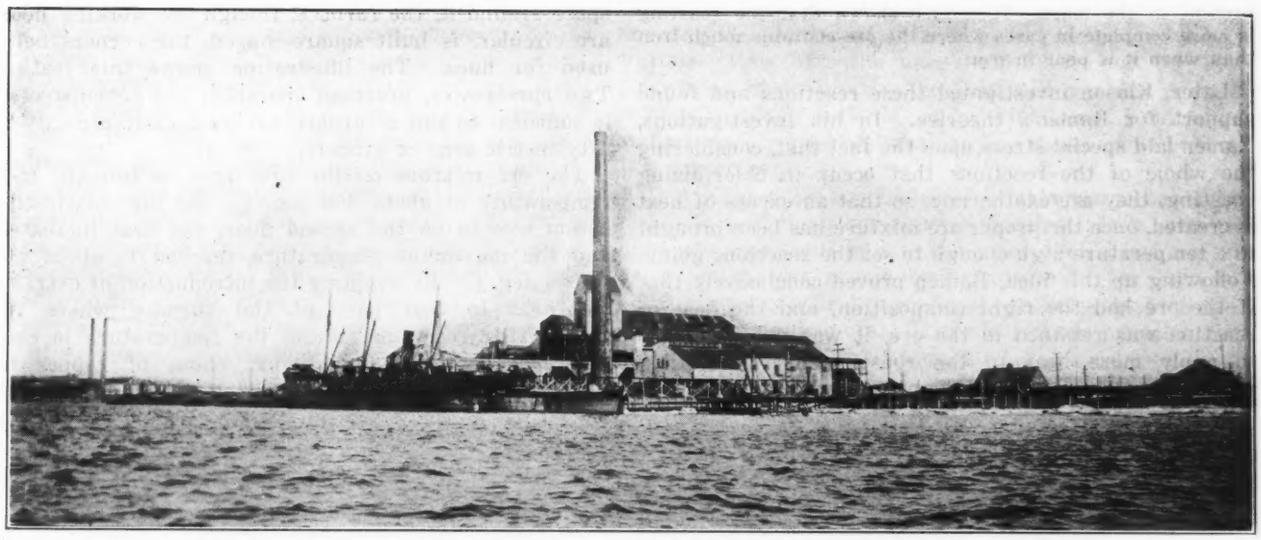
Denver, Col.

The Correspondence School Engineer

After reading the letter of Leroy A. Palmer in the Feb. 12 issue of the *Engineering and Mining Journal* I desire to say that I commend his action in sticking up for the correspondence school engineer. I haven't gotten above common labor in mining work as yet, but am making an effort to do so through a correspondence course in mining engineering, and it certainly is slow, uphill work. The contemptuous reference in the article referred to is most humiliating and discouraging; also snobbish and narrow.

Tonopah, Nev.

RALPH M. CRAFTON.



THE FREDRIKSTAD COPPERWORKS IN NORWAY: A RAMENIA INSTALLATION

Chloridizing and Leaching as Practiced in Sweden

The Ramenia System of Treating Pyrites Cinder and Roasted Concentrates Containing Copper and Zinc—Leaching and Precipitation Difficulties Overcome—Spent Ore Valuable for Its Iron Content

BY N. OSTMAN
Written for *Engineering and Mining Journal*

THE chloridizing process should be given more consideration by metallurgists than has so far been accorded it. Many ores and concentrates now being reduced by other smelting operations could be treated to better advantage by the chloridizing method, which not only assures a higher total extraction of the metals ordinarily recovered, but in many instances also allows the recovery of the iron as a desirable iron ore.

The chloridizing process was invented by Longmaid in 1844, and in 1859 was applied to the extraction of copper from pyrite cinders by Henderson; therefore the name, the Longmaid-Henderson process. It consists in roasting the finely ground roasted pyrite or other sulphide ore with salt, whereby the copper compounds are made soluble. Many have stated that this process could be practiced only with ores containing less than 5 per cent of copper and that zinc, if present, could not be brought into a soluble state. It will be shown, however, that it has been successfully carried out with roasted concentrates containing 7 to 8 per cent of copper, and is, in fact, used in connection with the manufacture of lithopone.

CHEMICAL REACTIONS

Although the art of chloridizing cuprous cinders is comparatively old, few improvements had been made until the beginning of this century. At that time Ramén, then technical manager at the Copperworks in Helsingborg, Sweden, began research investigations, both theoretical and practical, to put the whole process on a more economical basis. In doing this work Ramén developed some new theories, by which he explains to a certain degree the chemistry of the process. To relate here all the reactions that take place in chloridizing roasting would be to go outside the scope of this article, and only the most recent work will be discussed. For a closer study of these reactions see Kothny in *Metallurgie*, 1911, heft 13, and Klason in *The Mining Magazine*, December, 1918. Ramén says:

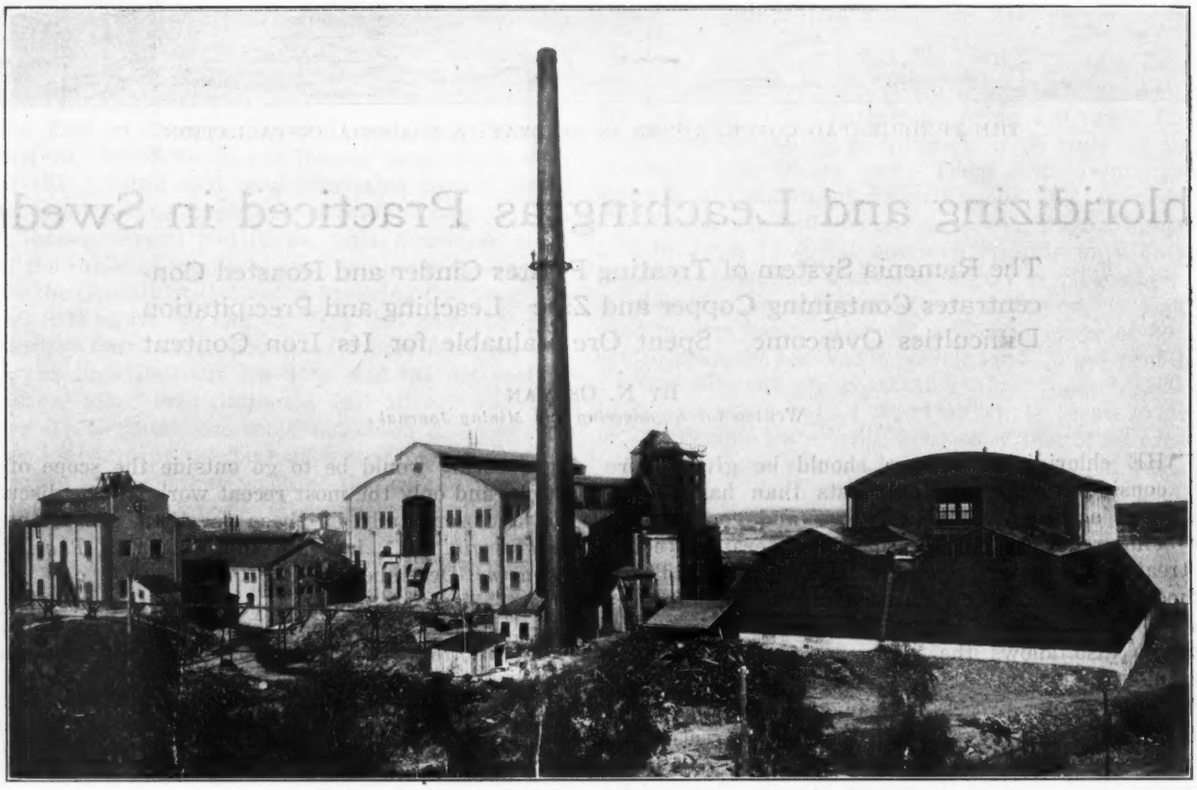
> The process, in my opinion, depends principally upon gas reactions. One must assume an oxidation of the sulphides by the air, the iron pyrites being the most important of these sulphides. Thereby the sulphides are decomposed into metal oxides and oxygen radicals, which again drive the chlorine out of the common salt. The chlorine then acts, chloridizing as free chlorine.
>
> 1. $2\ CuCl_2 + RS = 2\ CuCl + S + RCl_2$
> 2. $2\ FeS_2 + O_{15} = Fe_2O_3 + 4\ SO_3$
> 3. $SO_3 + O + 2\ NaCl = Na_2SO_4 + Cl_2$
> 4. $CuS + Cl_2 = CuCl_2 + S$
>
> It is evident that these reactions are theoretical, so that the intermediate stages must be imagined. SO_2 forms first, which, owing to the effect of the furnace mass as a contact substance, is oxidized to sulphuric acid. But even assuming a direct conversion:
>
> 5. $RS + O_4 = RSO_4$
> 6. $RSO_4 + 2\ NaCl = RCl_2 + Na_2SO_4$
>
> between the salt and the oxidized sulphides, one has clearly to deal with a gas reaction, an oxidation with the aid of the oxygen in the air. It is possible that reactions 5 and 6 take place, although I consider that 2, 3 and 4 are especially important for a complete roasting of the copper to chloride.

In another connection Ramén says:

> The theories I advanced a few years ago on chloridizing roasting, which at the present time is performed in most metallurgical works in the well-known Ramén-Beskow mechanical furnaces, seem for the greater part to have been confirmed by experience. It has been proved with a certainty that the mass acts as a contact substance in the formation of the chlorine necessary for the reaction, and I consider it proved that this action takes place principally by alternate oxidation and reduction of the iron compound

present in the mass. It is also shown that the roasting is more complete in cases where the ore contains much iron than when it is poor in iron.

Later, Klason investigated these reactions and found support for Ramén's theories. In his investigations, Ramén laid special stress upon the fact that, considering the whole of the reactions that occur in chloridizing roasting, they are exothermic, so that an excess of heat is created, once the proper ore mixture has been brought to a temperature high enough to set the reactions going. Following up this idea, Ramén proved conclusively that if the ore had the right composition, and the heat of reaction was retained in the ore, it was not necessary to apply more heat to the roasting operation than was required to get the reactions started. To apply this



OSCARSHAMN COPPERWORKS, OSCARSHAMN, SWEDEN

to practice, Ramén, together with Beskow, at that time manager at Helsingborgs Superphosphate works, developed the Ramén-Beskow furnace.

The furnace is of the multiple-hearth type, having a revolving central shaft to which are fastened interchangeable arms provided with removable blades or rabbles. The heat, generally created by burning producer gas, is applied to the first floor, and the combustion gases go through a special flue to the stack. Between the first and second floors is an arrangement by which these two floors are separated from each other, so that the furnace really consists of two separate compartments. The acid gases, which form in the lower compartment, leave through flues leading to towers, where these gases are condensed by water. The draft of the furnace is regulated by fans. The air passing through the furnace is under close control, so that rich acid gases are obtainable, resulting in a uniform and strong tower acid. To preserve the heat in the furnace and also to take full advantage of the ground space around it, the furnace, though the working floors are circular, is built square-shaped, the corners being used for flues. The illustration shows this feature. Two horsepower, practical operation has demonstrated, is sufficient to run a furnace having a daily capacity of fifty metric tons of cinders.

The ore mixture on the first floor is brought to a temperature of about 300 deg. C. As the chloridizing action sets in on the second floor, the heat increases, and the maximum temperature reached is about 550 to 600 deg. C. By avoiding the introduction of extraneous heat to that part of the furnace where the chloridizing reactions set in, the temperature is even and overheating cannot occur. Loss of copper by volatilization therefore does not take place, and the caking of the ore is insignificant. In furnaces fired directly at all stages of the roasting or by muffle effect, caking of the ore becomes at times very serious and makes necessary frequent barring of the hearths, which is tedious and hard work.

In the following table a comparison is given between this furnace and the old hand-muffle furnaces. The cost figures are given in Swedish kronor (Kr.) per ton of ore, based on pre-war prices:

COMPARATIVE ROASTING COST

	Hand Muffle Furnaces Per Cent Based on Weight of Ore	R.-B. Furnaces Per Cent Based on Weight of Ore	Hand-Muffle Furnaces Kr. Per Metric Ton Ore Roasted	R.-B. Furnaces Kr. Per Metric Ton Ore Roasted
Coal.....	About 10	1.6 to 2	1.44	0.21
Repairs....			0.33	0.25
Wages.....			2.09	0.36
Total Kr. pr. metric ton ore roasted.....			3.86	0.82

Acid recovered: 1 to 1.5 per cent.; 2 to 2.5 per cent.
Cu in purple (leached) ore: 0.12 to 0.20 per cent; 0.05 to 0.09 per cent.

The figures refer to Helsingborgs Copperworks, Sweden, where hand-muffle furnaces were used before

the Ramén-Beskow furnaces were introduced. Nine of these Ramén-Beskow furnaces are now in operation in this plant.

The Oscarshamn Copperworks, at Oscarshamn, Sweden, is of special interest, as it was put in operation only about two years ago and contains all the latest improvements that characterize the Raménia system.

The plant, being situated on the coast, receives all the cinders by barges. These barges are unloaded by an electric traveling crane, provided with a grab bucket, the cinders being loaded into a hopper car, which is pushed into the cinder storage and emptied. This cinder storage is under roof and holds several thousand tons of cinders. With the same crane, other storage bins are filled, holding a twenty-four hours' supply of cinders and salt. Below these bins are weighing hoppers. By this arrangement it is possible closely to regulate the percentage of salt in the mixture, also carefully to mix the cinders, of which several kinds are generally in storage. The Scandinavian plants handle mostly Norwegian pyrite cinders, and as there are several different pyrite mines in Norway whose product differs widely both chemically and physically, the different cinders must be kept separate. One man weighs out in one eight-hour shift sufficient ore to last twenty-four hours. From the weighing hoppers the ore and salt go to the screens and the milling plant.

A BATTERY OF RAMÉN-BESKOW CHLORIDIZING FURNACES AT THE HELSINGBORG COPPERWORKS

THE MILLING

To secure a good extraction of the copper, it is essential that the ore be properly ground before going to the furnaces. The ore treated by the chloridizing process is generally a previously roasted ore, which is soft and easily ground. It is important that the ore going to the furnace should not contain any too coarse particles, nor be ground to contain a large percentage of dust. Various types of mills have been used, but for the Norwegian pyrite cinders the Kent mill has been proved to be particularly suitable. A combination of Kent mills and screens is used and the ore is ground all to pass a 10-mesh screen.

Two Kent mills are installed in this plant, but only one is in use, the other being a reserve. It is wise to have one spare mill in case the other should get out of order, or the ore should be too coarse or too hard to allow a twenty-four hours' supply to be ground in the one mill in eight hours. There is storage capacity for 150 metric tons of ground ore.

The percentage of salt varies greatly. With some ores, containing up to 6 per cent of zinc the salt consumption is large, up to 20 per cent. In cinder mixtures with 2½ to 3½ per cent of copper and 2 to 3 per cent of zinc, 12 to 16 per cent of salt is used.

The roasting department consists of two seventy-five-ton Ramén-Beskow furnaces of the type already described. They are fired with producer gas, made from tarry wood. A fan blows the gas into the furnace, while by another fan, air is blown in and mixed with the gas at the gas intake. The wood consumed corresponds to about 2 per cent of coal, based on the weight of the cinders. To get the proper heat of reaction in the roasting operation, about 3.5 to 4 per cent of sulphur is wanted in the cinders, when these contain 2½ to 3 per cent of copper. The cinders which are used here often contain 4 to 6 per cent of sulphur, partly owing to the high percentage of zinc. Cast-iron fans are mounted between the furnaces and the acid towers. These are driven by motors provided with speed regulators, which

allows a close control of the draft. The furnace motors also have speed regulators.

One man on each of three eight-hour shifts attends to the two furnaces. On the day shift, one extra man helps the furnaceman to change the blades on the rabble arms and do the necessary barring on the floors. One man on each shift and one helper on the day shift, a total of four men, are thus required to attend to the two furnaces. In Helsingborgs Copperworks, where nine furnaces are operated, four men attend to three furnaces.

Tests were made recently on flotation concentrates made from Sulitelma pyrite. The desulphurized concentrates assayed Cu, 7.2 per cent; S, 4 per cent, and Fe, 42.5 per cent. These calcines were mixed with salt, the mixture containing 23 per cent of NaCl, and chloridized in a fifty-ton Ramén-Beskow furnace. In leaching the chloridized concentrates a bed, three feet deep, was kept in the tanks, and the purple ore, secured after leaching, contained 0.09 per cent of copper.

LEACHING

In leaching chloridized pyrite cinders in the old way hard lumps often form on the bottom of the leaching tanks, which lumps or cakes may cause a considerable delay in the leaching operation. In some plants this formation has been so bad that thousands of tons of such lumps have accumulated, not only giving great difficulties in recovering the copper from them but also causing considerable operating losses. To overcome this lump formation, Ramén designed the *pre-leaching machine*. In this apparatus a thin layer of the roasted, hot material from the furnaces is evenly sprayed with just so much water that the anhydrous sodium sulphate, which causes the formation of lumps, gets enough water for crystallization, thereby becoming easily soluble. The ore is moistened, but still remains in a powdery state.

A considerable amount of steam is generated during this process, which is condensed, giving hot water for the leaching, usually enough to eliminate the use of additional steam for heating purposes. In a plant leaching the hot ore according to the old method, there always was an atmosphere of steam and dust, which was very destructive to the woodwork and particularly corrosive on the iron and machinery. By using the leaching machine, this nuisance is entirely overcome, and a leaching plant having this apparatus is characterized by a clear atmosphere and, on account of the absence of all dust, by a clean appearance.

By preparing the chloridized ore in the leaching machine before going to the leaching tanks, a uniform leaching is obtained, and the time of leaching is considerably shorter than with the old way. The pre-leaching machine is run continuously, and the pre-leached ore then goes to a storage bin, where it is picked up by a grab bucket and placed in the leaching tanks. Two pre-leaching machines are erected at Oscarshamn, of which one is a reserve. To attend to this machine, one man is required for each eight-hour shift. This man, however, also does miscellaneous work around the plant.

The leaching tanks in Oscarshamn are built of reinforced concrete. They hold eighty to ninety metric tons of calcines and have an ore bed about three feet deep. The ore, after passing through the pre-leacher, is still hot enough to give the liquors such a temperature that the copper can be precipitated without the addition of extra heat, and yet not hot enough to damage the leaching tanks. The time of leaching, before these machines were used, was from thirty-five to forty-five hours to each tank, but this new system allows this time to be cut in half.

The liquors in the leaching department are pumped by centrifugal pumps of wood construction, which have been used ever since the plant was started and have proved successful. Air lifts are also used as a reserve.

From what was said in connection with the furnaces it can be understood that the tower acid is strong. It is kept with an acidity of 15 to 20 gr. HCl per liter. This acid allows a thorough extraction of all soluble copper. I may say, in this connection, that the Norwegian ores which are being treated here form less water-soluble copper in the chloridizing process than do the Spanish ores. A final wash with water is given to the purple ore before it is dug out. After the ore is thoroughly leached, the purple ore, containing, on an average, not over 0.07 per cent of copper, is dug out by a grab bucket.

The labor required to attend to this leaching plant is one craneman to each of two eight-hour shifts, and one leacher to each shift, making a total of five men in twenty-four hours. If the plant were extended to handle 300 metric tons in twenty-four hours, the crane would have to run another eight-hour shift, so the number of men in this department would then be increased by just one man.

In European copper works which have to buy their cinders the copper is expected to pay the cost of the whole process, and the profit lies in the purple ore. It is therefore readily understood that the production of a high-class purple ore with low copper and sulphur, such as is obtained here, is of the greatest importance.

PRECIPITATION

The chloridizing process, as it formerly was carried out, required a large number of men. With the present high price of labor it has therefore been necessary to reduce the number of men in the precipitation department by introducing mechanical aid. Precipitation is being done in revolving iron drums of large cubical contents, suitably lined to prevent corrosive action of the copper liquors on the iron. This mechanical precipitation, as carried out in Oscarshamn, also precludes the use of steam for heating the copper liquors. The solutions going to the precipitation process have a strength of 20 to 30 gr. of copper per liter. This liquor runs by gravity from the leaching department to storage tanks in the precipitation department and has a temperature that is sufficient to allow a good precipitation of the copper in the drums. It is only in very cold weather or when the liquors for some reason have been stored so long that they have cooled down considerably that steam is being used in heating the liquors. The only manual labor required in the precipitation department is for filling scrap into the drum and for emptying the filter presses.

While the liquor is running into the drum, the scrap iron is thrown in, whereupon the drum is started revolving. This operation requires from thirty to sixty minutes. After the copper is all precipitated it is transferred to a filter press and well washed.

This system of precipitation has several advantages, compared with the old way of precipitating in open tanks. Some of these advantages are:

1. The number of men employed is reduced to about one-half.

2. The solutions are treated at temperatures ranging

from 30 to 40 deg. C. By precipitating the copper in a closed vessel, the heat of reaction produced is utilized, and extra steam for bringing the liquors to the proper temperature is not necessary.

3. By pumping the liquors with motor-driven centrifugal pumps, steam siphons, so expensive in operation, are also discarded.

4. The air being excluded in the precipitation process, practically no basic iron compounds will be thrown down with the copper, resulting in a purer cement copper than is otherwise obtained.

5. The copper cement produced contains 85 to 90 per cent of copper, against 65 to 75 per cent with the old method.

6. By washing the cement copper in a filter press, a product is secured containing very little chlorine.

7. The copper in the waste liquor is infinitely small.

Two men on each of three eight-hour shifts, or a total of six men, attend to this department. With a 300-ton plant the same number of men would take care of the precipitation department. The following table indicates the labor requirements of the respective operations:

RÉSUMÉ OF THE LABOR USED IN THE OSCARSHAMN COPPER-WORKS, HANDLING 150 METRIC TONS CINDERS PER TWENTY-FOUR HOURS

	Number of Men per 24 Hours.
Cranemen	
1 in the cinder storage on one 8-hour shift 2 in the leaching plant on two 8-hour shifts	3
Milling	
1 weigher, on one 8-hour shift 1 attending to the crusher on one 8-hour shift	2
Roasting and Chloridizing	
3 furnacemen, one man on each of three 8-hour shifts 3 for the gas generator Note: The gas is also used to fire a boiler. These three men are not needed if firing with oil.	6
Leaching	
3 leachers, one on each of three 8-hour shifts 3 for the pre-leacher, one man on each of three 8-hour shifts Note: The three pre-leacher men are also used to do miscellaneous work around the plant.	6
Precipitation	
2 men on each of three 8-hour shifts attending to the drum and the filterpress	6
Extra	
1 man as helper to the furnacemen	1
Foremen	3
Total	27

If the plant were doubled to 300 metric tons capacity, only nine men more would be required as follows:

3 furnacemen, 3 tending the ore going to the furnaces, 1 weigher, 1 millman, 1 craneman	9
Total	36

To this must be added the repair gang, which in Oscarshamn was made up of

Machinists	4
Leadburner	1
Helpers	4
Electricians	3
Carpenters	2
Total	14

The number of men in the repair gang depends on the plant in general. In the operations discussed no other process is connected with the plant, so the copper process must carry the whole burden of these men, whereas in most other works the cost of the general repair gang is divided among several processes.

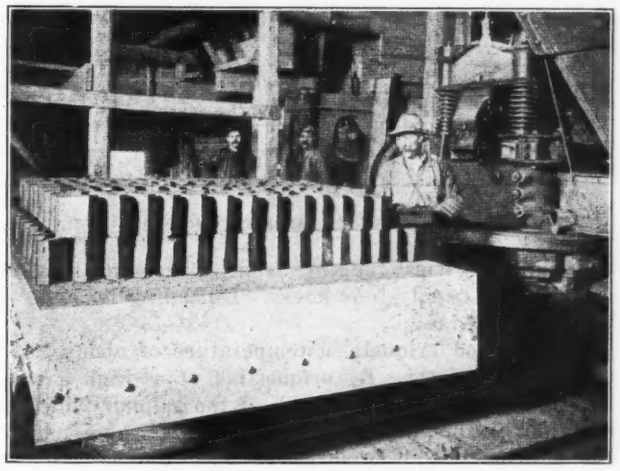
In one foreign plant using old methods and treating 300 metric tons of cinders daily, a force of 100 to 110 process men was required. These men, too, worked twelve-hour shifts.

The chloridizing process has, in late years, been applied to zinkiferous cinders with the object of securing zinc solutions for the manufacture of lithopone, and a number of Ramén-Beskow furnaces are now being operated for this purpose.

The salt used in the roasting is to a large extent converted into sulphate; thus, the sulphur in the ore goes largely into solution as sodium sulphate. Sulphuric acid otherwise used to dissolve metallic zinc or its oxide, or to leach roasted ore, thus is partly or altogether dispensed with in connection with the manufacture of lithopone by this method. Local conditions determine which process is the most advantageous, and in determining this one must also take into consideration that, as in some European plants, the residual leached ore or what is known as purple ore might be valuable as an iron ore.

BRIQUETTING THE PURPLE ORE

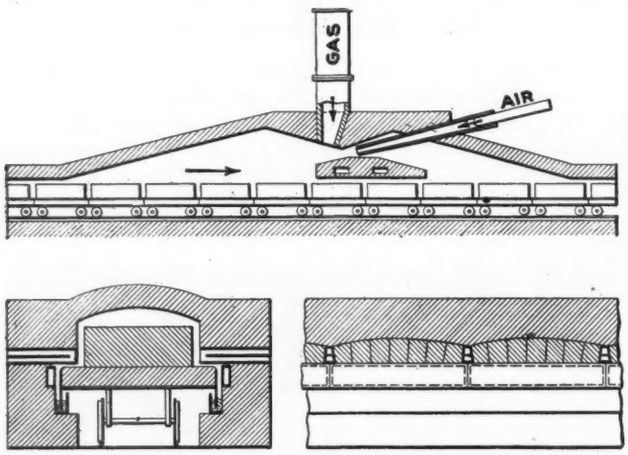
Although the purple ore might be a good iron ore, it is, however, not very desirable for blast furnace work in its original state, on account of its fineness. Its content of iron is governed by the pyrite or other ore from which it is made, and if made from ordinary pyrite cinders this generally ranges between 55 and 68 per cent. It contains as a rule not over 0.01 per cent of phosphorus; 0.2 per cent of sulphur, and 0.1 per cent of copper. It has been used, and in some places is still being used, in its original fineness in blast furnaces, mixed with lump ore, but owing to this fineness, a large percentage of it is likely to be blown away by the operation of the blast.



BRIQUETTING PRESS AND CAR LOADED WITH BRIQUETS READY FOR BURNING

In 1891, Bird found that the purple ore could be pressed and burnt to good briquets without using any binder. In 1896 Gröndal and Dellvik made the same observations regarding finely ground iron ore, which resulted in the construction of the Gröndal briquet press and furnace. In the first briquet presses, the briquets were formed by heavy blows. These briquets were not uniform and would often crack in the burning. Ramén introduced, at the Helsingborg plant, presses using the principle of slow compression. By the slow compression the briquets become stronger and stand the handling better. These briquets, after the burning, are also more uniform and solid. One of these presses can make 1,200 an hour.

Tunnel furnaces for burning briquets were first used by Anderson in America in 1888. Later, Bird, in England, and Gröndal, in Sweden, introduced these furnaces and were granted patents on them. Their principal drawbacks were that the briquet cars would burn out and the briquets, as they were loaded on the cars, would get close to the walls, and, touching these, would form a slag with the brick, causing the walls to fuse, which would result in frequent repairs. Ramén has patented some improvements whereby these difficulties have been overcome. By building heavy arches resting on water-cooled supports, and using water-cooled boxes to protect the sides of the cars from the effect of the strong flame, a briquet furnace has been constructed that has proved very substantial. Ramén's briquet furnaces are generally built with a width of 2.1 meters, whereas the older furnaces were only 1.5 meters wide. The furnace is



SECTIONAL VIEWS OF THE RAMÉN BRIQUET FURNACE

built in capacities ranging from 75 to 110 tons of briquets per twenty-four hours. Unloading by hand is also eliminated.

To get good briquets, a temperature of about 1,450 deg. C. is required. By briquetting at as high a temperature as this, practically all of the sulphur which is contained in the purple ore is driven off.

The briquets thus produced are desirable as iron ore. They are used extensively in England and Germany, and assure a saving of 8 per cent of the coke in the blast furnaces compared with ordinary iron ore. The capacity of the blast furnace has in some instances been increased by 30 per cent by using these briquets.

For a daily production of 150 metric tons of finished briquets two seventy-five-ton furnaces were used, at the Helsingborg plant, requiring a crew of seven men on each shift of eight hours. The cost of production per metric ton of briquets was, in 1914, in Swedish kronor, 2.91. Briquet furnaces of this type have been installed in works in Sweden, England, Germany, Austria, and Japan and are handling 600,000 tons of purple ore and iron concentrates a year.

[Note.—The Raménia system described has been installed in Norway, Sweden, Germany, Austria, Russia, and Japan. The Ramén-Beskow furnaces are somewhat similar to the American Wedge furnace. Their use has so far been confined to Europe and Japan, though an early model was used for several years, and may still be, at the West Norfolk plant of the Virginia Smelting Co. The American agents are Hamilton & Hansell, of New York.—EDITOR.]

New England Economic Minerals and Gem Stones Exhibited in Boston*

BY GEORGE F. KUNZ

Written for *Engineering and Mining Journal*

Few are aware that New England has precious minerals that are used as gems after being cut in various forms. The southern part of Maine, in the towns of Paris and Auburn, is the best-known locality where the gem minerals are found. Another, not now as productive as Maine, is in central Connecticut. Boston also can boast of producing a few of the semi-precious stones. In the Museum of the Boston Society of Natural History in Boston an excellent collection of New England minerals has been placed on exhibition. There is an economic geology collection consisting of building stones, ores, and minerals. Among the ores are several specimens of the silver-bearing galena from a mine in Newbury, Mass.

The minerals from the Maine gem quarries and pegmatite area, the Connecticut pegmatite area, the Bolton, Mass., mineral region, and the local minerals found in the Boston city area are arranged according to localities. Practically half of the collection is from Maine. Maine tourmaline, a mineral which is prized most of all by those engaged in working the quarries of the Mount Mica-Mount Apatite region, is exhibited in groups according to the color, green, blue, pink, and parti-colored crystals. Another case contains all the other varieties of minerals from this southern Maine area except quartz.

The beryls form the most striking group, aquamarine, pink, blue, white, and yellow or "golden beryl," in both opaque and transparent forms, being represented. Topaz, chrysoberyl, cassiterite, apatite, lepidolite, and feldspar, as well as some of rarer species, are represented. The purple apatites of Maine have been conspicuous because of their depth of color and beautiful crystal form. The Natural History Society has the second-largest crystal of apatite ever found in Maine, and it also possesses the largest crystal of chrysoberyl.

A third case contains quartz from the same area. There is a great variety, rose, milky, amethyst, and citrine. The prize specimen is a large crystal of amethyst from Denmark, Me. It is said to be the finest crystal of its kind ever found in Maine, and many gems of high quality could be cut from this crystal. A specimen of rose quartz, one of the two known specimens of this mineral in a crystal form, was added last year to the collection.

The minerals in the fourth case are from Middlesex County, Conn. The more important species are tourmaline, beryl, rose beryl, chrysoberyl, columbite, iolite, rose quartz, lepidolite, and mica. Many of these vary markedly in color from the same varieties found in the pegmatite area of Maine. The Bolton case presents a strong contrast to the others, as the minerals exhibited are not associated genetically with pegmatite, as are those of Maine and Connecticut. The principal mineral is scapolite or wernerite, which is often of a lilac color. Other minerals include forsterite, boltonite, and titanite. The greater part of this collection was obtained from George L. Brigham, a farmer living in Bolton.

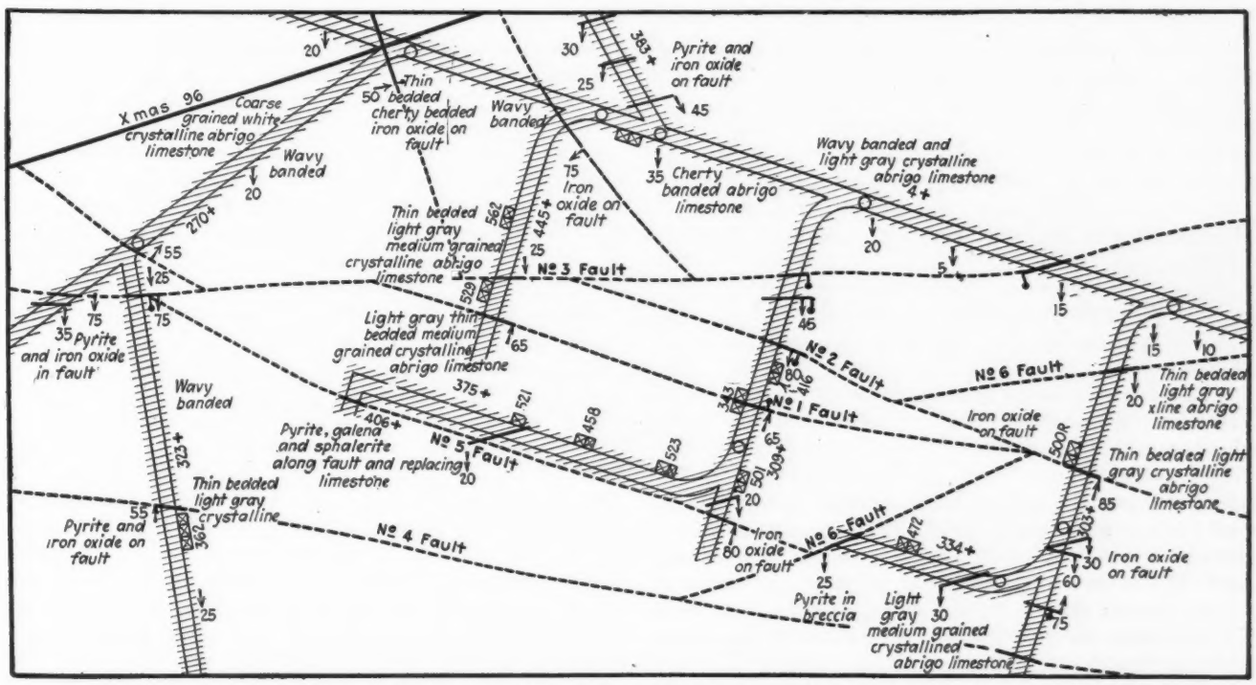
*A more extended description of this exhibit is given in Bulletin No. 23 of the Boston Society of Natural History.

Mine Geological Surveying

Study of Underground Geology Often Necessary in Planning Prospecting—Detailed Mapping Of Levels Important—Value of Such Work to Mining Operations Depends on Type of Deposits

BY GRAHAM JOHN MITCHELL
Written for *Engineering and Mining Journal*

ONE FEATURE which marks the advance in the mining industry of today is the building up of strong co-ordinate working organizations. The increased scope of mining operations has led to the creation of various departments, such as executive, operating, engineering, safety, accounting, geological, and others. I purpose discussing here the work of a geologist in connection with an operating mine and to outline methods found serviceable in carrying on such work.


Xmas 96
Coarse grained white crystalline abrigo limestone
Wavy banded
Thin bedded cherty bedded iron oxide on fault
Wavy banded
Pyrite and iron oxide on fault
Thin bedded light gray medium grained crystalline abrigo limestone
Iron oxide on fault
Cherty banded abrigo limestone
Wavy banded and light gray crystalline abrigo limestone
No 3 Fault
Light gray thin bedded medium grained crystalline abrigo limestone
Pyrite and iron oxide in fault
Wavy banded
No 2 Fault
No 6 Fault
No 1 Fault
Iron oxide on fault
Thin bedded light gray xline abrigo limestone
Pyrite, galena and sphalerite along fault and replacing limestone
No 5 Fault
Thin bedded light gray crystalline abrigo limestone
Thin bedded light gray crystalline
Pyrite and iron oxide on fault
No 4 Fault
Iron oxide on fault
No 6 Fault
Iron oxide on fault
Pyrite in breccia
Light gray medium grained crystallined abrigo limestone

GEOLOGICAL MAP OF UNDERGROUND WORKINGS, DEMONSTRATING MANNER IN WHICH FORMATIONS MAY BE DESIGNATED. ABBREVIATIONS WILL LESSEN SPACE NEED FOR NOTES

The fundamental purpose of geological surveying in an operating mine is to determine the areas most likely to be ore bearing and to direct prospecting toward such sections. To carry out this purpose, a study of the geology must be made and the plans for prospecting based upon data thus secured. Geological studies can be of further service in the development of orebodies by locating faulted portions, by directing development raises, sub-raises and sub-crosscuts advantageously, and in other instances, as will be pointed out later.

The resident geologist has an advantage over one called in for a special examination, in that he can be constantly in touch with operations and thus secure and act upon information which might not be available later. He can also be on hand to alter any plans which new geological evidence indicates to be necessary or to suggest further work based on these new facts.

Before starting detailed investigation, it will be found helpful to make a reconnaissance of the mine in company with some one familiar with the different workings. By so doing a general idea of the underground operations can be secured which will aid in making preliminary plans for the work to follow. One of the first questions to be considered is the scale upon which mapping is to be done. It is advisable to use the same scale as that of the engineers' level maps, thus permitting the tracing of the workings on each level upon the base maps for recording geological data. These base maps are of tracing cloth and vary in dimension according to the size of area included. Sheets 48 by 33 in., allowing for an inch border, are of a convenient size. In some instances more than one sheet may be needed, and when this condition arises the mine can be divided into sections, each section numbered and made to join the adjacent one.

The scale of level maps varies with different mining companies, 50 and 100 ft. to the inch being common, with 40, 80, and 200 scales sometimes in use. For work of any considerable detail, 50-scale maps will be found satisfactory, as practically all necessary data can be recorded on such maps. If desirable, a larger scale map can be used for areas having special problems, such as complicated faulting or where refined stratigraphic studies are required. From the base maps, the crosscuts, raises, and winzes of each level are transferred to sheets to be taken underground; these being 8 by 10 in., of medium-weight co-ordinate paper and their

location on the base maps determined by east-west and north-south co-ordinates. For work on 50 scale this will allow the mapping of an area 400 by 500 ft. on each sheet.

Transferring of workings from the base maps to the underground co-ordinate sheets is done by means of a glass-topped draughting table. If such a table is not available one can easily be made by placing electric lights under a piece of plate glass set upon supports.

The equipment carried underground can be reduced to the following: A Brunton transit, a pick, a metal holder for co-ordinate sheets, colored pencils, 2H and 4H pencils, a 50-ft. cloth tape, sample sacks, a sample book, a small note book for detailed sketches, an eraser, a celluloid combination scale and protractor, a carbide lamp, a match case, a wire for cleaning the lamp, and a small piece of candle. All this equipment can be carried conveniently in a hunting vest.

Work Should Start with Detailed Mapping

The survey should begin with a detailed mapping of each level, the one to be taken up first being determined by conditions at the mine under examination, and mapping proceeding consecutively from one level to the next. By so doing, data such as faults, formations, and mineralization, can be correlated between levels as the work progresses. Lithology, structure, and mineralization should be the first features to receive attention. If the mine is in an area of igneous rocks, the determination of the different igneous members, their distribution, age, structure, relation, and genetic bearing upon metallization are of prime importance, and faults, fractures, and fissures should be considered in the light of their bearing upon ore genesis and structural deformations.

Where both igneous and sedimentary rocks are involved, the sequence of the sediments must be determined, especially if the ore is found to occur at certain stratigraphic horizons. It is also important to find index beds in the stratigraphic series which can be used for correlative purposes. The associated igneous rocks should be classified, and if possible their importance as sources of metallizing solutions determined. Mineralization should receive close scrutiny, the mode of occurrence, age relation, and alteration of the minerals being important factors.

Is the orebody a vein or a bed? Are the walls of the vein sharply defined, or do they show irregular replacement? Does ore follow certain beds, or is it an irregular replacement without regard for any particular formation or bed? Is the ore disseminated through the igneous rock? Are the ore minerals of the same age, or do they represent successive periods? What alteration has taken place in the primary minerals and what are the resulting minerals? These are some of the important questions which arise and which can be solved only by detailed geological work.

Method of Procedure

Mapping will begin, say, at the shaft from which main crosscuts radiate. Choosing one of these, the work may be carried along the drift to its end, provided caving or other obstructions do not block the opening. The formations are recorded in black, and the conventional U. S. Geological Survey symbols for sedimentary, igneous, and metamorphic rocks are used. Faults are shown in blue, and red is used for fissures and fractures as well as for mineralization. In depicting mineralization, the minerals occurring at each particular point are noted.

Distances are determined by pacing, the length of pace for the individual having first been determined and checked between points of known distance such as raises, crosscuts, winzes, or stations. It has been found that practice will enable one to pace very closely distances of 50 or 100 ft., and measured points can generally be found for checking distances thus paced. If closer measurements are needed they can be made with a tape which has a nail at one end for fastening in timbers or fissured rock. When one drift has been mapped, adjoining ones can be taken up until the level has been completed. The geology in raises, winzes, and stopes should be studied, as such workings supply data which may not be available on the levels.

The accompanying sketch illustrates a method of mapping. The strike of limestone is shown and the dip indicated. The faults are projected from drift to drift and their age relation is shown.

The numbering or naming of faults will be helpful when their correlation between levels is attempted. Abbreviations will lessen the space needed for notes. Transferring of underground notes to the base maps is done by tracing from the co-ordinate sheets. The colors and symbols used for formations are the same as employed underground, and mineralization can be differentiated from ore by using different colors. All data on base maps should be in ink. Other office work includes making structure sections, which are essential in planning prospecting and developing. Sections on a 100 scale taken every 100 ft. will show the essential features, although a larger scale may be used in special cases.

Planning of Prospecting and Development Follows

With the initial survey completed, and the data thus secured studied and correlated, the next work will be the planning of prospecting and developing. Some work of this nature will suggest itself during the examination, but general plans can best be made after the initial survey has been finished, this being particularly true for work on new levels. For example, if the primary survey shows the orebodies to be replacements in sedimentaries along zones of faulting or fracturing, the determination of trend and location of these zones will make it possible to direct new work so as to cut them on the other levels with the least amount of drifting.

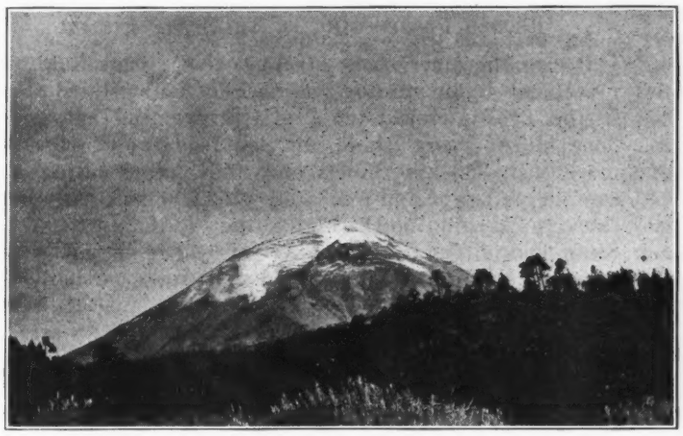
To make maximum use of the results of his work, the geologist should keep in close touch with underground operations and visit new work as often as possible. He should transfer to the operating department without delay geological facts which have a bearing on its work. In companies where the superintendent keeps in close touch with underground work he is the proper person with whom to discuss such matters. Proposed work can be suggested to the operating department by notations on blueprints of the different levels. New crosscuts, raises, and other openings can be shown in pencil, with their direction and distance to be run indicated. The foreman who is in charge underground will thus be able to see at a glance the work proposed and can fit it into his scheme of operation. In developing stopes or in prospecting for faulted portions of ore, a blueprint of the area in question, showing the proposed work, is a satisfactory way in which to bring the matter to the foreman's attention.

The assistance which geological surveying can render mining operations will vary according to the type of deposit under consideration. In some instances, such as in a deposit of disseminated copper, geological work practically ends when the ore-bearing rock has been determined and drilled. On the other hand, if the ore-bodies are small and scattered replacements in sedimentary rock, or if they are a series of veins with repeated faulting, the geologist's work is not completed until the last possible chance for finding ore has been exhausted.

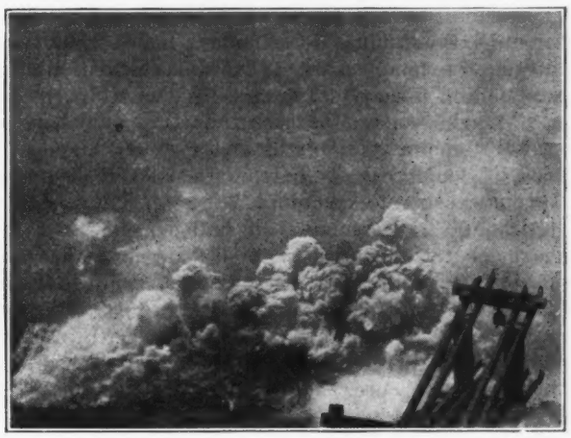
A Trip to the Top of Mount Popocatepetl

MINING ENGINEERS will no doubt be interested in the accompanying photographs of Mount Popocatepetl, which were taken by Bennett R. Bates, manager of the Dorr Co. at Mexico City, during a recent trip to that famous peak.

According to "Political and Commercial Geology," "It has been reported several times that a British company was about to operate the sulphur deposit of the Mexican volcano, Popocatepetl, near Mexico City. Statements regarding the deposits in the volcano are conflicting, but investigations indicate that their magnitude has been much exaggerated. Many other deposits occur in connection with local volcanic areas, but so far are of little economic value because of inaccessibility."



MOUNT POPOCATEPETL FROM RANCHO DE TLAMACAS



A "BLOW-OFF" AT "POPO"

The photographic views furnished by Mr. Bates give ample evidence of this latter opinion, for it is quite apparent that effective operation could be carried on only by means of gas masks or other self-contained breathing apparatus. It is also worthy of note that to reach the peak of "Popo" requires somewhat of a climb, for the elevation attained is over 17,000 ft. above sea level.

The picture on the left was taken from Rancho de Tlamacas. Close observation shows steam issuing from the crater, although this feature is not so well shown as in the photograph reproduced on the front cover. A "blow-off" is shown in the picture on the right, the action being somewhat similar to that of a geyser in eruption. The "blows" occur about every ten minutes, although the periods are not regular, nor is the volume discharged at each "blow" the same. The framework shown is the old gallows frame used for hoisting the sulphur.

There are no ashes rising from the crater, although the so-called smoke, which is ordinary steam, carries a small amount of dust, and the presence of this may account for the newspaper report of the local roofs being covered with ashes. The steam also carries considerable hydrogen sulphide and sulphur dioxide gas, the latter no doubt resulting from the action of the superheated steam on the sulphur.

Practically no snow remains on the east or Puebla side of the mountain, and only a fraction of the former amount remains on the west side. The disappearance of the snow could be accounted for either by the heating of the rocks from below, a rise in temperature of the surrounding atmosphere by the large amount of steam now leaving the crater, or a combination of both causes. As the east side of the crater is lower than the west, practically all the steam escapes there, and it is on this side that there is least snow, so that it is probable that the disappearance of the snow is due mostly if not entirely to the rise in temperature of the surrounding atmosphere brought about by the large amount of steam now leaving the crater. Mr. Bennett states that he does not anticipate a new eruption of lava, as the emission of steam is nothing extraordinary for an old volcano.

Roasting and Chloridizing Tin Ores

The metallurgical treatment of sulphide silver-tin ores mined in Bolivia was covered in a short paper by M. G. F. Söhnlein, which was written for the New York meeting of the A. I. M. E. and read in abstract form by E. H. Robie. The most important and difficult step in the process of reducing these ores is that of chloridizing roasting. Furnaces of the McDougall type were found unsatisfactory, chiefly on account of high dust losses, and a straight-line furnace was developed which proved much more suitable for the purpose. Mr. Söhnlein points out that whenever it is important to obtain a uniform roast, the operation should be conducted in furnaces operated on the intermittent system, for if anything goes wrong in a continuous furnace, much time is lost and a product unsuited to the following operations is discharged. The advantages of a roasting furnace of the straight-line type in roasting for magnetic separation or for differential roasting of complex sulphide ores preceding flotation were explained in considerable detail in the paper.

No discussion of this paper was offered at the time the abstract was read.

Industrial Development of Zinc

A Comparatively Young Metal Whose Production and Uses as a Metal and Chemical Are Increasing — Although Operators in the Industry Were Individualistic in Their Business Tendencies a Few Years Ago, a Change Is Taking Place

By Stephen S. Tuthill
Secretary, American Zinc Institute
Written for *Engineering and Mining Journal*

ZINC, sometimes called "the metal mysterious," is, like the oriental woman, fast ridding itself of the veil. To Paracelsus, the Swiss medical philosopher, is credited the discovery of zinc, in 1520. "Zinc," as Walter Renton Ingalls has said, "is commercially a relatively young metal. The ancients did not know it at all. The Chinese had it, probably in only a small way, several hundred years ago, but the production in Belgium was not begun until 1807. Then for many years the industry was only a trifling and struggling affair. There was no broad market for the metal. The people did not know what to do with it. It was not until Dominique Mosselman, a man of vast energy, entered the business in 1818, and devoted himself to establishing a market for zinc by educating the people in its various uses, that the industry could be said to have its commercial birth, and even at his death, in 1837, it could scarcely be said to exist in the west of Europe except in expectancy."

Although zinc remains an indispensable ally of the pharmaceutical chemist, in the last decade it has become of absorbing interest, also, to the technical chemist. Clarke places its atomic weight at 65.37, its specific gravity at 7.12, and its fusing or melting point at 418 deg. C. Found generally throughout the world, zinc occurs in ores as oxide, silicate, sulphide, and carbonate.

In the United States, the principal zinc-mining districts are in northern New Jersey, east Tennessee, Illinois-Wisconsin, Missouri-Kansas-Oklahoma (Tri-State), and in some of the Western States. C. E. Siebenthal, geologist, U. S. Geological Survey, who is the historian of the zinc industry in this country, estimated in 1918 that the United States possesses 36 per cent of the zinc resources of the world.

The Difference Between Copper and Zinc Mining

William A. Ogg, one of the best informed zinc men in the United States, said in 1919:

"Deposits of zinc in the United States, as a general rule, can be more easily, quickly, and cheaply opened up, developed, and operated than deposits of other metals, such as copper, silver, gold, and, perhaps, lead, although there is not so much difference between lead and zinc as regards accessibility." (In the Tri-State and Illinois-Wisconsin fields the zinc orebodies are only between 150 and 300 ft. below the surface.)

In further explaining the overproduction of zinc at times, with resultant low prices, Mr. Ogg said:

"To give some idea of the difference in productive value between an investment in a Missouri-Kansas-Oklahoma zinc mine, which for convenience of expression we shall call a Joplin zinc mine, and an investment in, say, a copper mine in Arizona, I have compiled some figures which indicate that $1 invested in the average Joplin zinc property will produce in one year approximately 60 lb. of recoverable slab zinc, worth, at 6c. per lb., say, $3.50, whereas $1 invested in a copper property in Arizona will produce in a year only about 4½ lb. of recoverable copper, worth, at 15c. per lb., about 70c., a ratio in quantity of about 14.5 : 1, and in value of about 5 : 1. It is clear, therefore, that a rise of a cent in the quotation of slab zinc means about fourteen to fifteen times as much on his investment to the Joplin producer as a rise of one cent in the quotation of copper does to the Arizona copper producer on his investment, subject, of course, to whatever share of the advance he may have to distribute to labor, smelter, etc."

Record Prospecting in Tri-State Field

It is, therefore, not strange that Otto Ruhl, a prominent Joplin mining engineer, recently stated that in the Tri-State field ten years' prospecting had been done in two years' time. In that field there are now more than 200 zinc mines and mills, representing an average outlay of approximately $150,000 each. Another cause for keeping up the high output of zinc in the Tri-State field is that the percentage of lead in the ore runs from one-fifth to two-fifths, and sometimes one-half, of the total.

After the ore has been mined, concentrated, roasted, and distilled or electrically treated, it becomes the slab zinc of commerce, and in this form it is extensively used in the arts, as in the manufacture of brass, for zincking or galvanizing iron and steel, and for roofing and the like. With the exception of several electrolytic zinc plants, the ore is distilled in natural or in producer-gas-fired retort furnaces.

The ore is roasted at the smelter to remove the sulphur content, and this in turn is converted on the premises into sulphuric acid, to be used in the manufacture of explosives and fertilizers and in the refining of oils.

Mr. Siebenthal has stated that the period between 1835 and 1860 was one of experimentation and inconsiderable production of zinc; in fact, he estimates at 800 tons the production of slab zinc in 1860, the beginning of the second period in the development of the industry. Slowly but consistently this tonnage grew, until it reached 400,000 tons in 1914. The output of slab zinc rose in 1916, on account of the war, to 720,000 tons. It dropped to 700,000 tons in 1917, to 550,000 tons in 1918, and to 485,000 tons in 1919. Of the latter amount about 145,000 tons was exported. In 1920 the output of slab zinc approximated 480,000 tons, and a satisfactory export market existed until September, when a reverse movement set in and has continued ever since.

Slab zinc was selling at the close of the war under four general specifications; high grade, intermediate, brass special, and Prime Western, with a zinc content ranging from 99.85 to 98.00, and a relatively corresponding differential in price, but since the signing of the armistice this differential has at times practically dis-

appeared—although many manufacturers continue to specify the grades and brands with the work of which they have become familiar.

About 50 per cent of the slab zinc produced prior to 1914 was used in zincking or galvanizing plates and wire, but the requirements of zinc for war purposes seriously affected its application for that purpose. At that time about 40 per cent of the slab zinc produced was used, with copper, for making brass, practically one-third of the composition of which is zinc, and because of the demand for brass for ammunition and gun parts the greatest outlet for zinc during the world war was naturally in this direction. The remaining 10 per cent of the pre-war output was rolled into plates and sheets. Two of the new uses for sheet zinc are in the manufacture of shingles and corrugated sheets. These in considerable quantity are now being used at home and exported the world over.

Use of Zinc Increasing

In rolled as well as in spun and drawn form, the use of zinc is multifarious and is rapidly growing. The War Industries Board, in its efforts to conserve for war purposes the use of other metals less plentiful than zinc, published a list of over 150 different channels in which zinc in its various forms can be advantageously utilized. The high explosives sent abroad during the war were shipped in zinc-lined containers, because zinc resists atmospheric influences. Without the zinc sender, an automatic telegraphic device, high-speed signaling through cables could not be done.

Rolled zinc is susceptible to a high, a dull, or a frosted polish, and is easily formed into complicated shapes. It can be enameled or plated with gold, silver, nickel, or brass without annealing, and given any of the finishes commonly used for brass or bronze articles. Sheet zinc for sheathing in homes, factories, and farm buildings prevents molding and keeps out water, cold, and vermin. The durability of zinc is almost axiomatic. Just as nature gives to the fur-bearing animals coats to protect them from the cold, so the weather gives to exposed zinc a thin and firmly adherent coating of basic carbonate, which completely protects it from the atmosphere.

Variety of Applications

The compounds of zinc have variable applications; for example: Zinc oxide (made by burning zinc in the air) is fast growing in favor as a pigment in paints, to the life of which it adds appreciably; it is essential to resiliency and durability in rubber automobile tires, comprising from 40 to 50 per cent of the whole in weight, and it is a valuable agent in pharmaceutical preparations. Zinc chloride is used in medicine for cauterizing and as an astringent and disinfectant; in the arts, it serves as a preservative of wood, and as an etching medium; in microscopy, for differentiating fibres of silk, wool, and plants. Zinc sulphate (a compound obtained by the action of sulphuric acid on zinc) is used in medicine as an astringent and an emetic and in electrogalvanizing. Lithopone (a dry white pigment made of zinc sulphate and barium sulphate) is used in wall paint and in making wall paper and linoleum. Zinc dust (a powder obtained by atomizing molten zinc or by condensing zinc vapors) is used as a reducing agent in dye making and in cyaniding and sherardizing. It is also employed by naval vessels in making smoke screens.

Not a few men still active in the industry knew some of the pioneers in zinc in the United States, among whom were Wetherill, Wharton, Matthiessen (F. W.), Hegeler (E. C.), George, Lanyon, Meister, Weyman, Hesselmeyer, Squire, Farrington, Burrows, and Curtis. There are others, some living and some dead, to whom the industry is equally indebted. In fact, the business structures which their successors and beneficiaries are today rearing rest upon the foundations which all of these men of faith and ability laid in the days when zinc slowly was making its way to the commercial front, and when the centennium of zinc in the United States is completed the names of many of the men now identified with the industry will have been added to zinc's distinguished service roll.

Until the war demands of the Government necessitated the mobilization of the zinc industry, the zinc men of the United States were probably more individualistic in respect to the conduct of their business than those engaged in any other business. Lack of co-operation not only within each branch, but also between the different branches of the business, prevented the development of that craft acquaintanceship which means so much in furthering the interests of any industry. During a meeting with some of the zinc producers in Washington in the summer of 1918, however, Pope Yeatman, an eminent mining engineer then in charge of the Non-ferrous Metals Sections of the War Industries Board, advanced the opinion that the interests of the zinc men as a whole might be greatly helped by an organization similar to the American Iron and Steel Institute. Soon afterward (July, 1918) the American Zinc Institute was formed by these men, and today its members, numbering more than 200 and representing 125 zinc mining, smelting, and rolling-mill interests in the United States, are working as one to increase the use of zinc. These business men now admit that they know one another better and understand better one another's problems.

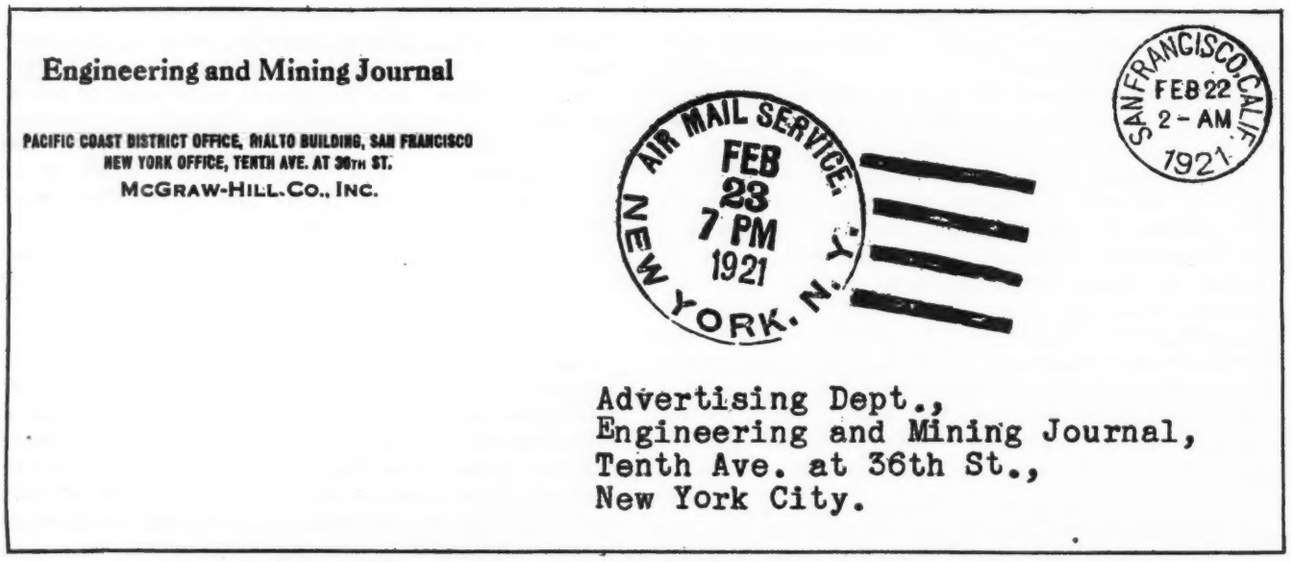
To take up the slack in the consumption of zinc growing out of the cessation of hostilities the Institute has for some time been working upon a plan to introduce zinc for roofing purposes as extensively as it has been used for many years in England and upon the Continent and in other ways to increase the use of zinc.

Several of the larger zinc companies have erected laboratories, in which they are spending hundreds of thousands of dollars annually in finding new uses for zinc, and as an evidence of the spirit of co-operation which has begun to prevade the industry, these laboratories have been opened to the problems of every zinc man in this country.

Since the American Zinc Institute divested zinc of its nicknames, the most glaring of which was "spelter," the consuming public, through the printed page and the motion picture, has begun to learn in a large way of the metal zinc and its manifold uses.

Increased Production of Cadmium in 1920

The output of metallic cadmium in 1920 was 129,283 lb., compared to 99,939 lb. in 1919 and 127,164 lb. in 1918, according to the U. S. Geological Survey. The production of cadmium sulphide was 32,133 lb., compared to 31,197 lb. in 1919. The combined value of metallic cadmium and cadmium sulphide in 1920 was about $188,500, compared to $159,362 in 1919 and $258,518 in 1918. Though prices were a few cents lower in 1920 than in 1919, the industry closed the year in better condition than in 1919.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ONE OF THE LETTERS CARRIED ON THE RECORD TRANSCONTINENTAL AIR MAIL TRIP

Spanning the East and West

THE LETTER ENVELOPE which is reproduced above formed a part of the mail cargo which was carried from San Francisco to New York by all-air route in thirty-three hours and twenty minutes. The letter reached our office Thursday morning. For obvious reasons the stamps affixed to the envelope have been left out of the illustration, but we give our assurance that they are bona fide one-cent stamps, two of them, green in color, and with the picture of George Washington on each.

No doubt many of our readers are familiar with the details of this transcontinental trip, which has established a record and promises to serve as a forerunner to an even shorter-period mail service between New York and San Francisco. However, we outline herewith some of the particulars of the journey, believing them to be of considerable interest.

Pilot Allison descended at Hazelhurst field, Mineola, Long Island, at 4.50 p.m. on Feb. 23, having left Cleveland at 1.03 the same afternoon. Fifteen minutes later Pilot Hopson reached the field, having left Cleveland thirty-one minutes after Allison. Both flyers used the standard D.H.4 biplane. Little time was lost at the various relay points on the journey, for at each station the mail was transferred to a new plane in which the engine was running and for which a fresh pilot was provided.

After leaving San Francisco, the first stop was made at Reno. A serious mishap occurred at Elko, Nev., when Captain William E. Lewis fell to his death in his plane. Stops were also made at Salt Lake City, Cheyenne, and Chicago. According to reports, the hero of the trip was Jack Knight, who acted as pilot from Cheyenne to Chicago, flying all night, a good part of the time encountering snow and fog. The highest altitude reached was about 12,000 ft., while crossing the Sierra Nevada Mountains in Nevada.

The record established during this flight along the trail made famous by the Pony Express will undoubtedly be accelerated. With the building of higher-altitude flying machines, it will be possible to take advantage of the trade winds, engines of greater capacity will be constructed, and other conditions will be modified and improved to permit even greater speed.

Imports and Consumption of Talc

IMPORTS of talc in 1920 were larger than ever before, according to the U. S. Bureau of Mines. Reports indicate total imports of more than 24,000 tons, valued at more than $475,000, which includes about 1,000 tons of crude talc, with a value of about $8,000. Imports in 1919 were 14,602 tons, valued at $259,004, compared with the previous record tonnage reached in 1916 of 18,882 tons, valued at $230,875. The average declared value of imported talc per ton in 1920 was about $20, as compared with about $17.50 in 1919. About 70 per cent of the imported talc came from Canada, about 20 per cent from Italy, about 8½ per cent from France, and the rest, 1½ per cent, was from England (probably originated in India), Austria, British West Indies, Denmark, Germany, and Sweden. The Candian talc had an average declared value of about $16 per ton, the Italian $35, the French $15, and the British (Indian?) $50. From these figures it appears that the chief competition which domestic producers must meet is that of Canadian talc, much of which is of high grade, suitable for the toilet-powder trade, and which sells for a comparatively low price. The total indicated consumption of talc from preliminary estimates is summarized below:

INDICATED TALC CONSUMPTION IN 1920

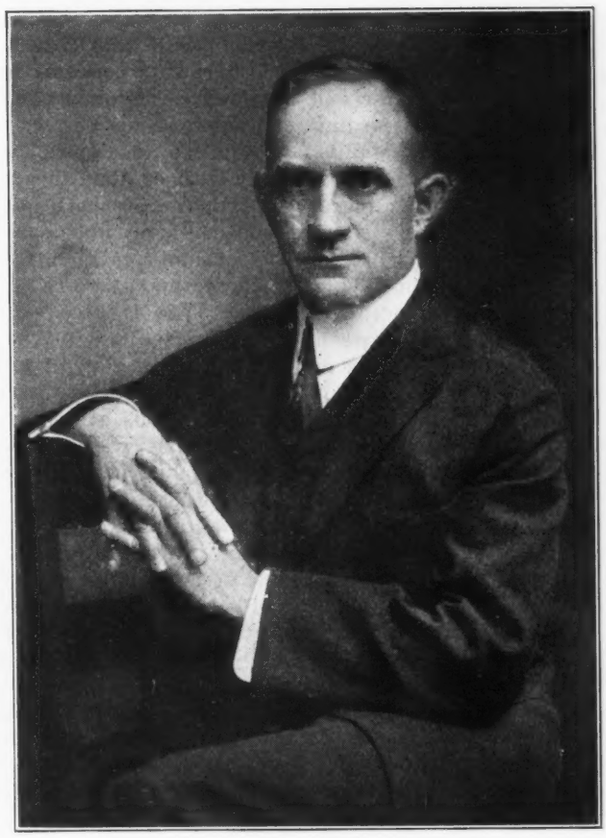
	Tons	Value	Value per Ton
Domestic	213,000	$2,360,000	$11.00
Imported	24,000	475,000	20.00
	237,000	$2,835,000	$12.00

Before the war most of the talc imported into the United States came from France and Italy at an average rate of about 4,000 tons per year from each country. The war caused little difference in these imports, except that those from Italy increased to over 7,000 tons per year, until 1917, when those from France dropped to about 1,500 tons and from Italy to about 4,100 tons. In 1918 the imports from France fell to 22 tons and from Italy to 490 tons. In 1919 there was only a slight increase over 1918. In 1920 the indicated imports from France were about 1,900 tons and from Italy about 4,400 tons. In the absence of definite information, it appears that the talc industry in Italy has recovered to its pre-war efficiency, but that of France has only partly recovered.

Metallurgists of Note

Harry A. Guess

CANADA has furnished more than her fair proportion of metallurgists and mining engineers. They seem to have overflowed that country, and graduates of McGill, Queens, and Toronto are likely to be found almost anywhere in the United States where important work connected with the mining industry is to be done. The subject of this brief sketch is one of our northern sister's best-known representatives. Our favorite table of memorable dates says that Nov. 21 is chiefly famed by the fact that North Carolina ratified the Constitution on that date in 1789. This event is of little importance in the Guess family, however, compared with that day, eighty-six years later, when Harry A. first looked out upon Hartington, Ont. (A little mental arithmetic needed here.) Following a public-school preparatory course, when fifteen years old he entered the School of Mining of Queen's University, at Kingston, which was not far from his home, and from which he secured an M.A. degree five years later, For two years thereafter Mr. Guess was engaged in surveying, assaying and mine examination in British Columbia. Severing his connection with this work in 1897, he became surveyor and assayer and later manager of the Ottawa Gold Mining & Milling Co. at Keewatin, Ont., a company which has since gone out of business. In 1901 he decided that the job was not as pretentious as the title, and accepted the call of the Guggenheim interests, who, by this time, had had wind of this promising young Canadian engineer. Rather than risk his life in a new country alone, however, he persuaded Miss Eva Young, of Winnipeg, to come along too. Mr. Guess's activities thereafter were divided among several properties in the United States and Mexico, but for the first few years he was at the Silver Lake mines, at Silverton, Col., where the complex ore problem offered plenty of opportunities to test his ingenuity. Later, Mr. Guess returned to this plant as superintendent. In 1907 he became general superintendent of the American Smelters Securities Co.



HARRY A. GUESS

Mr. Guess was one of the pioneers in using the flotation process in this country in the form in which it is now commonly employed. Since 1908 much of Mr. Guess's attention has been devoted to the Federal Lead Co. of Flat River, Mo. He is now president of that company, after occupying several minor positions. The plant has a capacity of close to two million tons of ore per year, which is treated in two mills by Hancock jigs, tables, and vanners, flotation equipment being provided for the slimes. In addition to his position as head of the Federal Lead Co., Mr. Guess is at present vice-president and managing director of the Federal Mining & Smelting Co.; vice-president and consulting engineer of the New York & Honduras Rosario Mining Co.; vice-president and managing director of the Premier Gold Mining Co., Ltd.; and consulting milling engineer for the Guggenheim Bros., the Braden Copper Co., and the Chile Copper Co. Mr. Guess was responsible for the very successful installation of crushing equipment at Chuquicamata, in which jaw, gyratory, and Symons disk crushers are used to reduce the ore to ⅜-in. size preparatory to leaching. As managing director of the mining department of the American Smelting & Refining Co., as well as being the final authority on milling for the Guggenheim interests, it can be well imagined that Mr. Guess finds his time well occupied. Even now he is on a two months' trip to South America. This is the reason why he is not a more familiar figure at the meetings of technical societies in New York. The local section of the A. I. M. E. for instance, he says, usually meets either the day before he has to leave town or else so soon after he gets back that he is too busy to get around.

Like the Hamiltons and the Howards and the Richards, the Guesses are sometimes confused. We forego the opportunity of making a pun. George A. Guess is professor of metallurgy at the University of Toronto, and is Harry's brother. Another brother, Ross, is manager of the Bank of Montreal at Renfrew, Ont. Then there is another Guess on the way, but as he is only thirteen years old he has probably not yet decided whether or not he will follow his illustrious father into mining.

CONSULTATION

The Uses of Graphite

"We understand there are two qualities of graphite—ground and flake. May we trouble you to advise in what industries the respective qualities are used. The difference in the price of the two qualities is very great, and it may be that the flake graphite is used only in small volume compared with the ground."

The two general classes of graphite are not ordinarily termed "ground and flake," but, rather, crystalline and amorphous graphite. This division is made according to the character of the mineral. Thus, crystalline graphite is ordinarily understood to include flake graphite (the scaly or lamellar form of the mineral usually found disseminated in metamorphic rocks), and the crystalline variety found in the form of more or less well-defined veins or as pockety accumulations along the intrusive contacts of pegmatites with limestones and schists. There is not much distinction between these two forms of crystalline graphite. The amorphous variety is an earthy-looking graphite containing crystals too small to be seen except with the aid of a microscope. Amorphous graphite is an extremely finely divided flake graphite, but it exhibits to the naked eye no appearance of crystalline structure. Because of this characteristic, amorphous graphite cannot be used for many purposes to which the flake varieties are adapted.

In order of importance, the principal uses of natural graphite are in the manufacture of crucibles, foundry facings, lubricants, paints, stove polish, and dry cells. Small amounts are also used in electrotyping and as a boiler scale preventive. The U. S. Geological Survey estimated that in 1918 the percentages of natural graphite consumed in the United States for these purposes were as follows:

	Per Cent		Per Cent
Crucibles	45	Pencils and paints	5
Foundry facings	25	Stove polish	5-10
Lubricants	10	Other uses	10- 5
Total			100

Both crystalline and amorphous graphites may be used in several of these classes of graphite consumption. In graphite crucible manufacture, however, the crystalline variety is demanded. It should be of high grade, lump, chip, flake, or vein graphite containing at least 85 per cent graphitic carbon, usually 90 per cent carbon, and free from easily fused impurities such as mica, pyrite, calcite and also quartz. Crucible manufacturers prefer to use Ceylon graphite exclusively, or with small amounts, up to 25 per cent, of American flake. It has been found that the Ceylon graphite requires smaller amounts of clay as a binder than the domestic material and is a purer grade of product. The lower limit in size of crucible graphite is 125 mesh, the higher 20 mesh, the ordinary range being 20-90 mesh.

For foundry facings amorphous graphite is mainly used. High-grade material is not essential, and the graphite is commonly mixed with talc or some other substance before being applied. Practically the only trade use for low-grade dust graphite, 40-60 per cent carbon, from the refining of flake material, is in foundry facings. There are no definite specifications for this grade of graphite or for foundry facings in general, and the flake product is also employed where a high grade of foundry facing is desired. The U. S. Geological Survey estimates that about 10,000 tons of graphite is consumed in this branch of industry annually.

Lubricants consume increasing amounts of graphite annually. The prime requisite for this class of product is that it should be free from abrasive impurities. Both crystalline and amorphous grades are utilized. It has been claimed that the amorphous and artificial grades of graphite are both purer and more capable of being reduced to an impalpable powder that will remain in suspension in oil than the natural flake graphite.

In the manufacture of pencils the amorphous variety of graphite is used chiefly, the soft earthy material being best suited for the purpose. Flake graphite and the Ceylon grades, plumbago, do not possess the same marking power. In American pencil manufacture, Mexican amorphous graphite is the principal graphite used, as it can be readily ground to a fine powder, whereas flake graphite, even after fine grinding, retains its flaky characteristics. Suitable hardness is obtained by mixing the graphite with varying proportions of clay.

Paints made of graphite have the property of being able to withstand corroding attacks of acids and alkalies, and hence make a valuable protective covering for metal parts subject to such attack. High-grade graphite is not required, and amorphous, crystalline, or artificial graphite may be used.

For stove polish, amorphous graphite is usually worked up in the form of a paste with the addition of various ingredients. High-grade material is not necessary, and carbon, or "lampblack," may be added to intensify the color.

Graphite for preventing boiler scale may consist of the very finely ground flake or amorphous and artificial varieties.

As fillers in dry cells, all three classes of graphite may be used. The fine dust from graphite mills or other low-grade concentrates, when properly cleaned, has also been found suitable.

Graphite brushes for dynamo and motor commutators may be made from the three common varieties of the finely ground material, with the addition of suitable binding ingredients.

Imported Ceylon graphite is customarily divided into three classes, ordinary lump, chip, and dust. Each of these classes is further subdivided into two or more grades, best, medium and poor. Prices vary with the class and grade of the product. Ceylon lump graphite contains about 90 per cent graphitic carbon, chip about 80 per cent, and dust approximately 70 per cent.

The domestic graphite is commonly graded into No. 1 flake, No. 2 flake, No. 3 flake, dust, and amorphous graphite. The first three or highest grades during the war were specified to contain 90, 85, and 80 per cent carbon, respectively.

THE PETROLEUM INDUSTRY

The Sanga Sanga Oil Field of Borneo

Several Interesting Features in Connection With the Accumulation of Petroleum Are To Be Found in the Koetei Region of the Dutch East Indies, Where the Principal Wells of the Dutch Shell Company Are Situated

BY W. H. EMMONS AND J. W. GRUNER
Written for *Engineering and Mining Journal*

THE oil fields of the East Indies are of interest to geologists not only on account of their production but because of their structural features. The detailed report and maps of the Sanga Sanga field, by Jezler,[1] have only recently come to the authors' attention.

The field is in the Koetei region, Dutch East Borneo, north of Balik Papan. Drilling was begun in the Sanga Sanga field in 1897. Early efforts were successful, and in 1911 the production was 495,124 tons. The preliminary drilling was guided by oil seeps entirely, but later work was directed by geological advice. The field is controlled by the Dutch Shell interests, which operate a refinery at Balik Papan.

The country is an area of Tertiary sedimentary rocks that dip southeast away from the older rocks that are found toward the center of the island. The Tertiary rocks are thrown into a series of long folds that are almost parallel and strike northeast about parallel to the coast. The field may be regarded as a great monocline with smaller folds developed on it. The eastmost fold is the Sanga Sanga anticline, and this anticline contains the principal producing wells. This fold is the lowest fold developed. The greatest oil accumulation is thus formed on the lowest or basinward fold. This relation was shown by Hewett and Lupton to exist in the Bighorn basin, and it is a noteworthy feature in certain other fields in the United States.

The Sanga Sanga anticline is 80 km. long and plunges probably at both ends. It has an undulating crest, and the oil pools are developed at the high places or domes on the crest. At the surface along the anticline oil seeps and asphalt deposits are numerous. Gas seeps are found also, and when visited by Hooze in 1888 these were aflame. The oil is associated with salt water. The anticline is a steep fold. The crest is nearly flat for a width of about 300 m. The southeast limb near the crest dips gently, but further to the southeast its dip becomes steeper, reaching a maximum of about 35 deg. The west limb is steeper, dipping in places about 60 deg. or a little more. Thus the basinward limb is the more gentle one, as is the condition in many mountain folds.

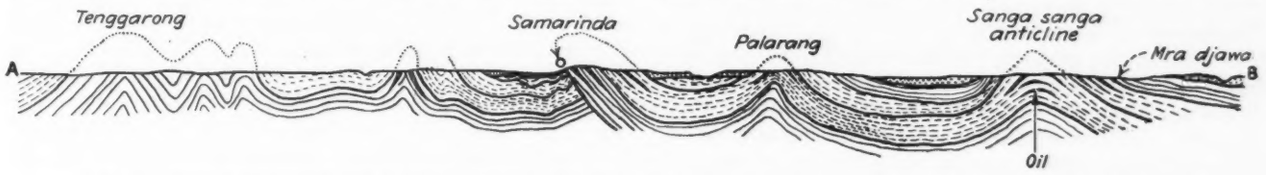


FIG. 1. CROSS-SECTION OF SANGA SANGA OIL FIELD ACROSS ANTICLINES AND ALONG THE MAHAKAN RIVER (AFTER JEZLER)

In the East Indies, practically all of the oil produced comes from Tertiary rocks, although the Permian, according to Jezler, is oil-bearing in Ceram and Timor.

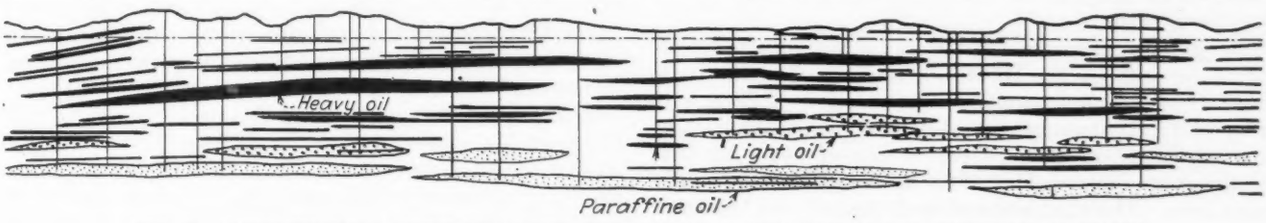


FIG. 2. LONGITUDINAL PROFILE ALONG THE SANGA SANGA ANTICLINE, SHOWING POSITION OF SANDS (AFTER JEZLER)

The Tertiary rocks are generally unconsolidated or poorly consolidated. After folding in the Koetei field there has obviously been extensive base-leveling, and laterites are developed in places. The oil of the Sanga Sanga field comes from the Miocene. Mud volcanoes and gas seeps are found above the crests of anticlines in Oligocene beds, but thus far (1916) the Oligocene has not yielded oil.

The petroliferous beds of the Miocene are sands which are covered with clays and marls. The oil-bearing series is of the Burdigalian division of the Miocene. Coals are found in this formation and also in the

[1]Jezler, H., Das Oilfeld Sanga Sanga in Koetei, Mederal-Ost-Borneo: Zeitschr. für prakt. Geologie, Vol. 24, pp. 77-85 and 113-125, 1916.

Oligocene below it and in the Pliocene above. In the oil-bearing series these coals at places form the cap rock of the oil sand and at other places lie immediately below the oil sand. A noteworthy feature of the coals or lignites is the variation of their water content with depth. Thus the Pliocene coals contain 30 per cent of water, the upper Miocene coals 20 per cent of water, the lower Miocene coals 14 per cent, and the Oligocene coals 10 per cent of water.

In this region fossils, except the Foraminifera, are rare. The water content of the coals is so nearly uniform that it can be used to determine the age of the rocks. This relation was first noted by Hooze[2] in 1887 and is confirmed by Jezler.

Three kinds of oil are produced in the Sanga Sanga field, namely a heavy oil, a light oil, and a paraffin oil. The heavy oil has a specific gravity of 0.96 to 0.89, the light oil 0.88 to 0.85, and the paraffin oil 0.86 to 0.84. The heavy oil is found at depths from 30 to 290 m., the light oil at depths from 200 to 400 m., and the paraffin oil at from 300 to 500 m. The names are not well chosen, for analyses reported by Jezler show that the heavy oil contains as much paraffin as the paraffin oil, if not more, although the paraffin content of the "light oil" is much less than that of the paraffin oil, that is found below the "light oil."

The origin of these oils is naturally of great interest. The heavy oil has obviously lost some of its lighter constituents by seepage to the surface. It yields no fraction below 150 deg. C., although the other oils yield between 16 and 33 per cent. The deep light oil called "paraffin" oil has obviously undergone metamorphism, as is suggested by the marked dehydration of the coals associated with it. Possibly it has undergone a natural cracking process.

As pointed out by David White, there is shown in many American fields a close relation between the grade of the oil and the character of associated coals. In the Sanga Sanga field the oil recovered is, as already stated, in the Burdigalian, which contains coal with 14 per cent water. Although oil is not reported by Jezler from the Oligocene, which contains coal with 10 per cent water, the dehydration of coal with depth and the increase in the lighter constituents of oil with depth are noteworthy.

Jezler has calculated the amount of oil obtained from wells in each of the three oil horizons for the years 1901-1906, and has plotted the production of each with respect to the axes of the anticline. It is shown that the northwest or mountainward side of the fold, that is the steep limb, yielded more light oil than the southeast limb. The basinward side of the fold, on the other hand, has yielded more paraffin oil, which, as noted, comes from deeper strata. Thus it is shown that production migrates basinward in depth, as is the condition in many other fields.

Illinois Drilling Attracts Attention

SPECIAL CORRESPONDENCE

Considerable excitement has been created by the results of recent drilling on the Columbia structure between the towns of Columbia and Waterloo, in Monroe County, Ill. The district is only twenty miles south of St. Louis and alongside of the Waterloo trolley line and the M. & O. R.R., and so is conveniently situated and accessible for operators.

Three wells have been found recently on a strong anticline that was mapped by the Illinois Geological Survey several years ago, but which attracted no attention until some oil was struck in drilling for water at Waterloo last spring at about 500 ft. The Ohio Oil Co. promptly secured a string of leases, and has recently completed three tests, one of which was a duster and the other two of which are reported as making 3 to 25 barrels of a fair grade of petroleum after being heavily shot.

The O. P. & R. Co., of Tulsa, recently brought in a well that is reported as good for 200 to 1,000 barrels, and four tanks of oil have just been pumped from it that indicate that it is at least a good well, especially as it has not yet been shot. The oil from the No. 8 sand, or Trenton limestone, is through a heavy fault, here found at the shallow depth of 400 ft. This well has attracted much attention from operators and speculators, and the value of leases is rapidly advancing There are now six rigs on the ground, with several more moving in, as the shallow depth and low cost for drilling are highly attractive, with Illinois oil now bringing $3.52 a barrel.

Another well was recently brought in at Centralia by Iowa interests on the Illinois pipe line, and much interest is being taken in the prospecting by the Petro Oil Co. at Irvington, a few miles south, where the presence of a strong dome points to the opening up of another rich pool in a district that has eight sands at 600 to 2,600 ft. The Petro Co. is drilling two wells.

Oil Industry as Public Utility Condemned

SAN FRANCISCO CORRESPONDENCE

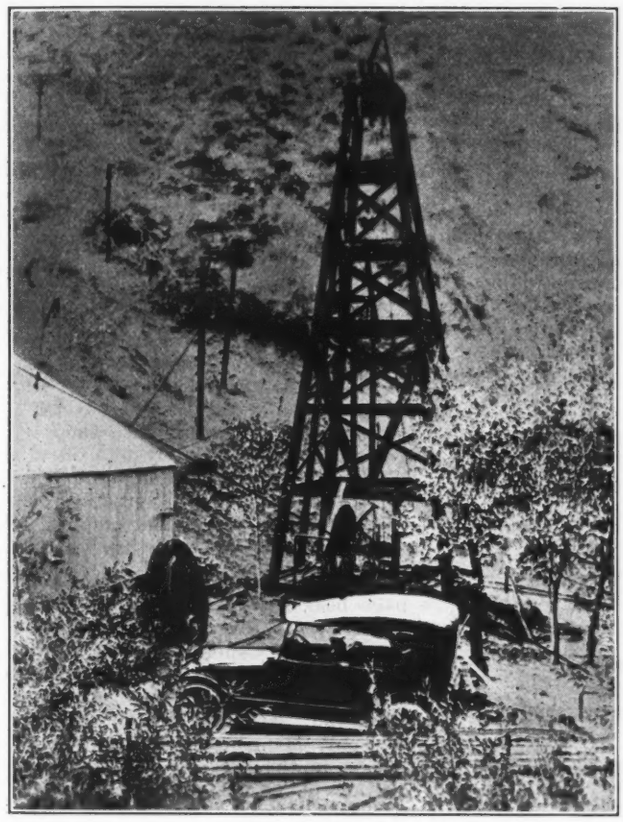
The committee on mineral resources of the Commonwealth Club of California met at luncheon at the Engineers' Club of San Francisco recently, at which time the legislation pending before the California Legislature, to declare the oil industry of California a public utility, was discussed. This proposed legislation is the latest that has appeared and belongs to the regulatory type from which there is so pronounced a reaction. No one at the meeting appeared to be in favor of this attempt to shackle the industry by placing it under the regulation and control of the existing state commissions.

William E. Colby discussed the legal aspect of the proposed law and expressed the opinion that it was unconstitutional, but he pointed out that the broad interpretation attached by the courts to the police powers of a state were such as to make it uncertain whether the courts would sustain such an enactment if it were placed on the statute books.

A. C. McLaughlin, of the Associated Oil Co., expressed the opinion that it was not practicable to put a mining business on a public utility basis. M. L. Requa said that the proposed legislation would not help the end desired, but would handicap the oil companies. It would operate to discourage individual incentive and in the end cause serious loss to the public. In his opinion it would make it difficult for the oil companies to serve the public. The sense of the meeting was as a whole against the legislation in question. S. H. Dolbear and C. A. Grabill presided at the meeting, which was attended by over forty oil men, geologists, and mining engineers.

[2]Hooze, J. A., Ondzerzoek naar Kolen in het Rijk van Koetei; Jaarb. v. h. Mijnw in N. O. I., Vol. 16, 2, s 5-94, 1887.

California's Oldest Oil Well



In the accompanying photograph is shown the first oil well driven in California, in Los Angeles County, near Newhall. Oil has been pumped from this well for forty years, and it is still producing.

Northwest Canada Oil and Gas Prospecting Regulations Announced

SPECIAL CORRESPONDENCE

The new regulations governing the disposal of oil and natural gas lands in the northwest territories of Canada have been made public. They supersede all previous regulations and are retroactive in effect. Permits may be issued to prospect for oil and gas over a maximum area of 2,560 acres for a period of four years. This area may be staked in not more than five blocks, for which five separate permits may be issued, requiring the installation of individual drilling outfits on each location. In the event of discovery, a lease of one-quarter of the area covered by the prospecting permit will be issued, at a rental of 50c. per acre for the first year, and $1 per acre for the second and third years. The royalty on the output is fixed at 5 per cent for the first five years and 10 per cent thereafter. The minimum area of a location is fixed at eighty acres, the remainder of the ground covered by the prospecting permit remaining the property of the Crown. An adequate drilling outfit must be installed on a location within two years of the date of the permit; drilling to a depth of 500 ft. must be conducted during the third year and to an aggregate depth of at least 2,000 ft. during the fourth year. Where these requirements are not fulfilled, the permit immediately lapses without the declaration of a forfeiture by the Crown.

Lessees who secured their tracts under the suspended regulations will experience no great difficulty in adapting their claims to the new regulations. In the case of applications for more than five leases consideration will be given to only five, and if fewer than five have been applied for an opportunity will be given to make up the number. If a lessee desires to surrender his lease and obtain a permit under the new regulations, he may be permitted to do so, provided the conditions of his lease have been duly observed. Leases issued under former regulations subject to renewal, the terms of which may expire, may be renewed in accordance with the new regulations.

World's Production of Petroleum

The estimated world's production of petroleum in 1920 is 688,474,251 bbl., against 554,505,048 bbl. in 1919, according to figures assembled by the American Petroleum Institute. This represents a gain of 133,969,203 bbl., or 24.2 per cent.

Of the total production in 1920 the United States supplied 443,402,000 bbl., or 64.4 per cent. Mexico supplied 159,800,000 bbl. (based on exports of that amount plus production marketed at home), or 23.2 per cent of the world's output.

By far the greater gains were made by the United States and Mexico. United States production increased from 377,719,000 bbl. in 1919 to 443,402,000 bbl. in 1920, a gain of 65,683,000 bbl., or 17.4 per cent. Mexico increased from 87,072,954 bbl. to 159,800,000 bbl., a gain of 72,727,046 bbl., or 83.5 per cent.

The estimated production in barrels by countries follows:

	1920	1919
United States	443,402,000	377,719,000
Mexico	159,800,000	87,072,954
Russia (*a*)	30,000,000	34,284,000
Dutch East Indies	16,000,000	15,780,000
India	8,500,000	8,453,000
Rumania	7,406,318	6,517,748
Persia	6,604,734	6,289,812
Galicia	6,000,000	6,255,000
Peru	2,790,000	2,561,000
Japan and Formosa	2,213,083	2,120,500
Trinidad	1,628,637	2,780,000
Argentina	1,366,926	1,504,300
Egypt	1,089,213	1,662,184
France (*b*)	700,000	.....
Venezuela	500,000	321,396
Canada	220,000	220,100
Germany (*b*)	215,340	925,000
Italy	38,000	38,254
Total	688,474,251	554,505,048

(*a*) No exact information available.
(*b*) The Alsacian field's production appears under Germany in 1919 and under France in 1920.

Applications for Utah Oil Leases Heavy

SPECIAL CORRESPONDENCE

Interest in the possible discovery of oil in commercial quantity in Utah continues to increase. Reports of the activity of companies affiliated with important interests in three fields—Circle Cliff, Gainesville and Huntington—have brought a greater volume of business to the Salt Lake City land office. On Feb. 14 there was such a rush of applicants for leases—50 in all—that several were waiting their turn when the doors closed late in the afternoon. Most of the applications were made for the maximum acreage—2,560 acres—allowed by the oil land leasing act of Feb. 25, 1920. The tracts sought are in various counties in southwestern Utah. The Old Emery Oil Co., which is preparing to open ground in the San Rafael region not far from Mohrland, has listed its stock on the Salt Lake exchange. The incorporators of this company are Salt Lake and Ogden men.

Book Reviews

This World of Ours. By J. H. Curle. Cloth; 5¾ x 8¼; pp. 313. George H. Doran Co., New York. Price, $2.50.

"It is not everybody's good fortune to go to Corinth," says William J. Locke in his "Far Away Stories," but J. H. Curle, in 1898, when, as he says, "the Elizabethan era of gold mining was at its height," resolved to go down into every gold mine in the world. Making a start in the Transvaal, where he served his apprenticeship as miner, millman, and assayer, and finally rounding off his education as a managing director, he continued a successful engineering career until the goal had been attained. The tally came to over five hundred mines in thirty-eight countries.

Concerning these years, which we may believe to be well filled, the author has only sketched, but reading between the lines we find a life of interest, full of excitements and experiences which many of us may envy. India, Queensland, Australia, South America, Siberia, the West African Coast, the United States, British Columbia, Mexico and Alaska—certainly a globe-trotting record that few mining engineers can equal.

But the wanderlust is still strong. An American engineer said to Mr. Curle, "They tell me it is a pity you have gone out of business. But my idea is you are the wisest of us all." This, following his determination to travel instead of continuing his professional work. So, "on the right side of forty," he proceeds.

The remainder of the book—and we forget for the time being that our guide has viewed the world as a place of drifts, shafts, stamp mills, and cost sheets—is a continuation of kaleidoscopic effects; familiar and strange countries, living conditions, climate, customs, a bit of history here, a personal incident there, and through it all the reader cannot fail to grasp some of the author's enthusiasm for the great adventure. The bull fight in Spain, the prayer hour of the Mahomedan, and the racing carnival at Calcutta—all impress us with the striving of many peoples in their attempt to solve the riddle of life.

The book is of intense interest, although it leaves the reader with a feeling of dissatisfaction, or, let us say, envy, because he has not followed in Mr. Curle's footsteps. As Mr. Curle stated in the early chapters, the world was his oyster—he opened it and therein found what he has so well expressed.

D. E. A. C.

Finding and Stopping Waste in Modern Boiler Rooms. Vol. II. Second edition. Flexible cloth; 5 x 7; pp. 414; illus. Published by H. S. B. W.-Cochrane Corporation, Philadelphia. Price, $1.

Publicity matter issued by manufacturers has in many cases grown beyond a mere advertising of the company's product. Many firms now issue authoritative data books, but this is the most pretentious one that has come to our notice. The first 94 pages are devoted to Fuels; a classification of the different varieties, their analyses and uses, with data on proper methods of storage and suggested specifications for purchasing. Then come 200 pages on Combustion, covering all phases of the subject and including combustion of powdered coal in stationary boilers. Section III treats of Heat Absorption; Section IV of Boiler Efficiency and Boiler Testing; and the concluding section, of Boiler Plant Proportioning and Management. The information given is from authoritative sources, much of it based on work done by the U. S. Bureau of Mines, and, except in the last few pages, no attempt is made to advertise the products of the company publishing the book. Its reasonable price should assure it a wide distribution among power-plant engineers.

Technical Papers

Mineral Resources—Recent separates of "Mineral Resources in 1919," issued by the U. S. Geological Survey, Washington, D. C. (obtainable on request), include: Foreign Graphite, thirty pages; Chromite, five pages; Gems and Precious Stones, 15 pages; Secondary Metals, thirty-four pages; and Mineral Waters, thirty-four pages.

Potash—Bulletin 715-B of the U. S. Geological Survey, Washington, D. C. (obtainable on request) is an illustrated pamphlet of thirty-eight pages descriptive of the potash deposits of Alsace. The bulletin is based on information previously published in foreign languages plus data secured by the author in a trip to the district in the spring of 1919. Bulletin 715-I discusses the potash resources of Nebraska and gives a list of the location and area of the productive potash lakes in that state.

Phosphate in Montana — U. S. Geological Survey Bulletin 715-J contains five pages and a map descriptive of the phosphate rock deposits near Maxville, Granite County, Mont.

The Divide District — The Divide silver district in Nevada forms the basis of a twenty-three-page pamphlet recently issued by the U. S. Geological Survey as Bulletin 715-K, and which may be obtained on request. The geology of the region, which lies just south of Tonopah, is discussed, and the following mines are described as of the summer of 1919, when the field work was done: Tonopah Divide, Divide Extension, and Tonopah Hasbrouck.

The Mogollon District — U. S. Geological Survey Bulletin 715-L describes the geology and important mines of the Mogollon (pronounced, mo-go-yohn) district in New Mexico. This important silver-gold camp, whose production has averaged consistently over a million dollars a year, is eighty-five miles from Silver City, the nearest railroad point.

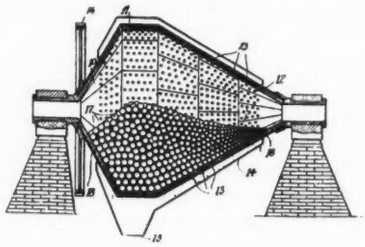
Manganese—A report on "Manganese Deposits at Horseshoe Range, Peak Hill Goldfield, Western Australia," has been prepared and issued by A. Montgomery, State Mining Engineer, Perth, Western Australia. The report covers locality, topography, geology, and ore estimates of the two principal deposits, which occur in a district formerly of interest only as a gold-mining section. Analyses of samples and consideration of transportation and costs are included, together with sketch maps.

Rhodesia Resources.—The 1921 report of the Rhodesia Resources Committee has just been received and may be obtained on request to the committee, P. O. Box 4, Bulawayo, Rhodesia. Most of the book is devoted to agricultural subjects, but about 75 pages will prove of interest to the mining profession. Mineral occurrences are described and good practical articles on prospecting and mining and milling on a small scale are included.

Swedish Mineral Statistics — A 104-page book giving the detailed mineral statistics for Sweden in 1919 may be obtained on application to Kungl. Kommerskollegium, Statistiska byran, Stockholm. The principal ore mined was iron, with pyrite, quartz, zinc, feldspar, manganese, and copper following in the order named. The production of electrolytic zinc amounted to 2,320,538 kg.

Recent Patents

Conical Ball Mill — No. 1,367,777. Harry W. Hardinge, New York, N. Y. A mill of the ordinary Hardinge type, with the exception that the conical portion is perforated, thereby allowing the escape of the ground material without passing through the trunnion. We are informed that this mill is designed to



operate on dry or slightly moist pulp for which mills of the Krupp type are commonly employed, and that two or three installations have already been made in such service.

Flotation Machine — No. 1,367,332. Robert Safford Towne, New York, N. Y., and Frederick B. Flinn, Orange, N. J., assignors to Pneumatic Process Flotation Co., N. Y. A pneumatic flotation machine in which the air is introduced at some distance from the bottom, thus providing a quiet zone in the bottom of the machine for the settlement of non-floatable particles.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Hoover Starts His Assay of Waste in Industry

Special Staff of Field Workers Active in New England, New York and Pennsylvania

According to a statement issued by American Engineering Council the offer of a Cabinet post to Herbert Hoover found the former Food Administrator deep in the details of a plan to promote economic, social, and political betterment within his own profession. Following his speech at Syracuse, in which he outlined the purpose of the American Engineering Council, of which he is president, to conduct a national assay of waste, a complete organization, known as the Committee on the Elimination of Waste in Industry, was set up, and it was announced that results of the preliminary survey started by Mr. Hoover were already beginning to come in to the headquarters of the council.

Largely through the efforts of Mr. Hoover, it was said, permanent organization of the council has been effected, and work begun in many directions. In co-operation with L. W. Wallace, J. Parke Channing, and other prominent engineers, Mr. Hoover is now directing a preliminary survey of industries east and west to ascertain at first hand facts upon which the Committee on Elimination of Waste in Industry can act.

This survey is being conducted by a special staff of trained field workers, principally in New York, New England and Pennsylvania, and is designed to furnish results which shall be the working basis of the most exhaustive investigation into the causes of labor unrest and industrial defects ever made in the United States.

As one of the investigators said, "We shall find out why three million idle men are walking the streets. If Mr. Hoover can be of greater service in the Cabinet then that is the place for him. It is doubtful, however, whether he can find a job much bigger than the one he has tackled as an engineer. His associates on the American Engineering Council regard his work as president of that body as even more important in its potentialities than was his work as food administrator. Under Mr. Hoover the engineer is becoming an enormously powerful force for constructive and disinterested public service. Mr. Hoover's labors in this field have only just begun, and it is the hope of the entire engineering profession, now auspiciously launched for the good of the nation, that they will bear the fruit which present progress promises."

The American Engineering Council's activities are closely linked in character and purpose with the type of work Mr. Hoover would be called on to perform as Secretary of Commerce.

American Mechanical Engineers Discuss Materials Handling

The meeting of the metropolitan section of the American Society of Mechanical Engineers, held on March 4 at Public Service Terminal, Newark, N. J., was particularly devoted to problems in the handling of materials. Benjamin F. Cresson, Jr., consulting engineer for New York and New Jersey Harbor Development, discussed the proper development of a seaport as a place where great quantities of materials must be handled promptly and economically. He was followed by Chief Engineer J. A. Shepard, of Montour Falls, N. Y., and by W. W. Lighthipe, of the Otis Elevator Co., who discussed material-handling machinery as applied to loading vessels and to charging warehouses, respectively. E. Logan Hill, of Heyl & Patterson, discussed the mechanical loading and unloading of freight cars. General Manager R. S. Parsons, of the Erie, closed the session with a rather complete summing up of the problems and solutions presented.

Graduate Fellowships in Mining Open at Urbana, Ill.

The Engineering Experiment Station of the University of Illinois announces twelve vacancies in its research fellowships (stipend of $600 annually), and some of these are available for the students of the Mining Department. This department is thoroughly equipped for laboratory work in coal, ore-dressing, hydrometallurgy, mine gases and dusts, rock drilling and explosives. There are also special courses in industrial chemistry of coal, and in mining economics, as well as association with resident engineers and chemists of the U. S. Bureau of Mines. Prof. H. H. Stoek, of the mining department, states that he will gladly furnish further information concerning these fellowships, which are free from most college fees during the two years for which the holder is appointed.

Belgium Founds a National Mining Institute

A royal Belgian decree dated Jan. 18, 1921, provides for the creation of a National Mining Institute at Frameries. The institute is charged with the study of everything that bears on an improved utilization of the mineral resources of Belgium. This will include the perfecting of methods, of tools, and of mining machinery, as well as the improvement of working conditions in the mines.

Engineering Society of Queen's Hears Mining Engineers at Annual Dinner

Queen's University of Kingston, Ont., has an active engineering society that dines annually in February to discuss the state of the Dominion. At the twentieth annual banquet, held on Feb. 17 last, a number of mining men took part in the program. Replying to Major-General Macdonnell's toast "Keep Canada Canada to the End", the Deputy Minister of Mines, Charles Camsell, responded by emphasizing Canada's need for young men to prospect and to survey her mineral resources. Prof. W. P. Wilgar toasted the engineering profession in a quizzically humorous speech, to which R. L. Peek, managing superintendent of the refinery of British America Nickel, responded, emphasizing the fact that engineers must realize their responsibilities, avoid early specialization, face the facts, and develop nimbleness of mind. T. Kennard Thomson, of New York City, also responded and spoke on projects for developing the Niagara and St. Lawrence Rivers.

G. C. Bateman, manager of the La Rose mine, at Cobalt, Ont., responded to Dean Clark's speech of welcome, and commented on the prevailing political and social unrest as being a transient phase in the struggle for democracy; and Fraser D. Reid, of Coniagas Mines, Ltd., pleaded for greater recognition by Canada of her debt to the scientist, and contended that "Canada should have a Bureau of Standards to make science more efficient." He thinks systematized work might bring a six-hour day.

Nation-wide Invitation To Take Part in Mining Exposition in Chicago

Preliminary announcement is made that the twenty-fourth annual convention of the American Mining Congress will be held in Chicago, Ill., next fall. A committee of twenty leading Illinois coal and iron producers, manufacturers, and bankers is being organized by Hon. Francis S. Peabody, who will be general chairman. Convention headquarters in Chicago are already open in the Congress Hotel, and John T. Burns, assistant secretary of the Mining Congress, is in charge.

Chicago's great Coliseum, where the National Republican Convention was held, has been leased, and plans are being made to hold a great national exposition of mines and machinery during "convention week." A nation-wide invitation is going forward to state administrative officers, state and national mining bodies, and operators generally to participate in the first exclusively mining show of any magnitude ever given in America.

MEN YOU SHOULD KNOW ABOUT

C. L. Beckwith is making examinations in the Morenci district, Arizona.

Stanley C. Sears, mining engineer, of Salt Lake City, Utah, was in New York City recently.

P. L. Foster was in Telluride, Col., recently on business connected with the Tomboy Gold Mines Co., Ltd.

Senator Frederic Nicholls, of Toronto, Ont., has resigned his position as president of the Dominion Steel Corporation.

T. D. Walsh, of Los Angeles, Cal., has taken a position as engineer with California Rand Silver, Inc., Randsburg, Cal.

Howard Birkett, mining engineer, recently returned to New York City from the Texas oil fields, where he has personal interests.

C. W. Mitchell has resigned as manager of the Montclair Mining Co. to develop property in the old Camp Fleming district of New Mexico.

Charles W. Potts, president of Northern Minnesota Ore Co., was before the Minerals Relief Commission recently in the interest of the Northland mine.

Dr. George K. Burgess, chief of the division of metallurgy of the U. S. Bureau of Standards, spoke before the Cleveland Engineering Society on Feb. 25.

Fredrick Bradshaw, general manager of the Tonopah Belmont and subsidiary companies, spent several days in Tonopah, Nev., recently inspecting the Belmont mine.

D. E. Sutherland, assistant general superintendent of the Oliver Iron Mining Co., Ironwood, Minn., is spending a few weeks at his winter home in West Palm Beach, Fla.

Gaichi Yamada, who is professor of metallurgy in the Kyoto Imperial University, Japan, is in Canada studying mining methods and processes. He was in Toronto recently.

William Brand, for many years connected with the Bacis Gold & Silver Mining Co., Ltd., has resigned as manager, and is now with the Compañia Mexicana de Petroleo "El Aguila" S. A.

E. P. Mathewson, Edwin Ludlow, Col. H. S. Dwight, and **E. H. Robie** are among the New York mining engineers attending the annual meeting of the Canadian Institute of Mining and Metallurgy at Montreal this week.

Joseph H. Ivey has resigned as manager of the Poderosa Mining Co.'s mines at Collahuasi, Chile, and is now in charge of the Corocoro United Copper Mines, Ltd., properties at Coro Coro, La Paz, Bolivia.

Dr. R. F. Ruttan, head of the Department of Chemistry at McGill University, Montreal, has been temporarily appointed to succeed Dr. A. B. McCallum as administrative chairman of the Canadian Advisory Council for Scientific and Industrial Research.

J. G. Newton, metallurgical superintendent formerly with the Cerro de Pasco Copper Corporation at La Fundicion, Peru, is now with the American Smelting & Refining Co., Maurer, N. J.

Don Juan Gómez Ortiz, mining engineer, of Spain, is traveling in the United States to study the applications of electricity in the mining industries. He was in New York City recently.

C. F. Powell, of Oklahoma City, Okla., has been appointed chief of the subdivision on natural resources of the office of the U. S. Commissioner of Internal Revenue. He succeeds **J. C. Dick**, who has resigned. Mr. Powell

Harris & Ewing
C. F. POWELL

was born in McPherson, Kan., and received his public-school education in that state. His higher education was obtained at the State Agricultural and Mechanical College, Stillwater, Okla., where he took the general engineering course. Early in the life of the mid-continental oil field, he took up oil work as a consultant and as a practical oil operator. In 1919 Mr. Powell joined the staff of the Commissioner of Internal Revenue as chief of the oil and gas section. He just has been promoted from that post to chief of the natural resources subdivision.

H. C. Bellinger, vice-president of Chile Copper Co.; **Fred Hellman**, consulting engineer for Guggenheim Brothers' interests, and **C. B. Lakenan**, general manager of Nevada Consolidated, have been inspecting Utah Copper property at Bingham and the concentrating plant at Garfield.

Mining engineers and geologists recently visiting New York City included: **W. J. Reynolds**, 2 Crescent Gardens, London, S. W.; **Spencer R. Logan**, Coffeyville, Kan.; and **Carl O. Lindberg**, Los Angeles, Cal.

SOCIETY MEETINGS ANNOUNCED

The second **conference of engineers and economists** at New School for Social Research will be held March 9, at 8:15 p.m. L. W. Wallace, W. C. Mitchell, and others will discuss "Waste and the Engineer." These conferences meet at 465 West 23d St. New York City, on the second Wednesday of each month.

OBITUARY

Howard M. Hanna, Sr., of Cleveland, Ohio, died at his winter home in Thomasville, Ga., on Feb. 8, at the age of eighty-one years. Mr. Hanna was one of the founders of the M. A. Hanna Ore Co. With the aid of his two brothers, the late Senator Marcus A. Hanna and Leonard C. Hanna, he had built the company into a large shipping and industrial corporation.

Don Manuel Gomez, managing director of the great Spanish Société des Hauts Fourneaux de Bilbao, Spain, is dead from wounds received in a murderous attack upon him recently at Bilbao. He entered the service in a minor position, and by hard work, combined with high intelligence, had risen to the highest post in the company's organization.

Alexandre Gouvy, metallurgical engineer (E. C. P. 1879), died suddenly on Jan. 21 while on a mission to Leipzig. He had held various important positions in French and Russian metallurgical establishments, and was widely known for his labors in popularizing modern metallurgical methods. M. Gouvy was sixty-five years old.

William L. Watts, for many years geological engineer for the Kern River Oil Fields of California, Ltd., died while returning from London to Trinidad, B. W. I., where he was working for his company. Mr. Watts, who was born in Edmonton, England, Sept. 24, 1850, was a former student of the University of Kansas, and studied under several prominent English geologists. In 1884 he became chemist to the Oregon Mountain Mining & Smelting Co., and from 1884 to 1889 he was in general practice in San Francisco, and was an expert for the California State Mining Bureau from 1889 to 1901. As the bureau's representative he studied the oil and gas formations of southern California in 1894. Since 1901 he had been in private practice again in Los Angeles, Cal. Mr. Watts was a member of A. I. M. E., of several California academies of science, and of many other societies and had written several non-technical works. He made many contributions to the annual California State Mining Reports.

THE MINING NEWS

LEADING EVENTS

Conkling-Silver King Coalition Decision Reversed

Supreme Court Sets Aside Judgment for $570,000 Awarded Plaintiff by Court of Appeals

The U. S. Supreme Court has reversed the decision of the Circuit Court of Appeals at St. Louis in the litigation between the Silver King Coalition Mines Co. at Park City, Utah, and the Conkling Mining Co. and has set aside the judgment for $570,000 awarded the latter company for ore taken by the Coalition from ground claimed by both companies. The ore in the Elephant stope was mined chiefly from a strip of ground 125 ft. in length. The Coalition company claimed the ore through apex rights and prior location.

In regard to the disputed ground, there was a discrepancy between the length of the Conkling claim as given in the patent and as marked by the location posts, the Conkling company claiming the ground carrying the ore according to the patent and the Coalition claiming it because of the position of the location posts.

The case was first tried in the U. S. District Court in Salt Lake City, Judge John A. Marshall presiding, and the Conkling company was the loser. In the Court of Appeals this decision was reversed and judgment for $570,000 awarded the Conkling company.

The Silver King Coalition then appealed to the U. S. Supreme Court for a writ of certiorari and the case was re-tried at Washington. The Government intervened in the last trial for the purpose of determining the question of priority of patent over location. It was ruled that the size of a claim is determined from the survey as marked by the location posts, and not by the figures as given in the patent when there is variance between the two. With interest to date of decision March 1, the amount at issue would have been approximately $706,800.

Iron Ore Freight Rate Hearing Set for March 12

Six Roads, Meanwhile, Announce Further Increase Plus Dock Charge—Shippers Ask That This Be Suspended

The hearing on ore freight rates, which concerns eighty-seven Lake Superior iron mining companies and the ten railroads serving the ore industry, will be held March 12 in Chicago by the Interstate Commerce Commission. The application is for a deduction of the rail rates from the mines to the upper lake loading docks. All mining companies except the Oliver Iron Mining Co. are parties to the action. Owing to the close relationship between two of the defendant railroads and the Oliver, the Oliver could not be a party to the suit.

A new angle to the situation has been created in the meantime by the fact that six of the railroads connecting the Michigan and Wisconsin ranges with Lake ports have announced an increase of 10c. per ton and an additional 5c. dock charge. A petition has been presented to the I. C. C. by thirty-six Michigan and Wisconsin ore producers to have this proposed increase of rates suspended.

WEEKLY RÉSUMÉ

At Washington the Senate has passed a more liberal war minerals relief measure, but favorable action by the House is said to be extremely unlikely. Considerable opposition has developed to the proposed 33⅓ per cent ad valorem tariff on cyanide, it being pointed out that this would be detrimental to the interests of gold producers. Attacks by Representative Mason, of Illinois, on Bernard Baruch, John D. Ryan, and copper producers in general, made on the floor of the House, were warmly answered. In a letter to Representative Garrett President Wilson has vindicated Messrs. Ryan and Baruch. Through opposition of Senator Thomas, of Colorado, the tungsten tariff measure failed to get a hearing in the Senate.

From Salt Lake City it is announced that Jesse Knight, long prominent in mining circles, is retiring as president of the Knight Investment Co. The hearing by the Interstate Commerce Commission on the new $6.50 freight rate between Utah points and San Francisco has attracted much attention. The commission's hearing on iron ore freight rates in the Lake Superior district has been set for March 12 at Chicago. A bill calling for a tax on iron-ore royalties has been introduced in the Minnesota Legislature. On the Gogebic Range the Steel & Tube Co. of America has cut its mining operations to a four-day-week basis. In Washington a renewal of activity in silver mining in the Oroville-Nighthawk district is reported.

British America Nickel Shuts Mine and Smelter Down

The mine and the new smelter of the British America Nickel Corporation at Nickelton, Ont., in the Sudbury district, were shut down indefinitely on Feb. 26, owing to the condition of the metal market. Between 600 and 800 men were thus thrown out of work. Four hundred more will lose employment when the company's refinery at Ottawa shuts down, which will occur soon.

Eilers' Campaign for Proxies Continues

In Two Letters to Stockholders Former Vice-President of A. S. & R. Co. Repeats Charges Against Guggenheims

Continuing his campaign against the management of the American Smelting & Refining Co., Karl Eilers has again circularized the stockholders of the company under dates of Feb. 24 and Feb. 26 in a continuation of his effort to secure their proxies for the annual meeting next month. He reiterates his charge that the Guggenheims have sold out, giving the number of shares held by the Guggenheim family as 324 and the total held by the board of directors as 2,444, out of a total of 1,100,000. He continues:

"In 1905, 1906, and 1907 the American Smelting & Refining Co. appeared to be at the height of its prosperity. Its common stock commanded $174 per share at the New York Stock Exchange. With its splendid credit, its officers could readily have financed for its account any of the opportunities that were presented to obtain interests in Utah Copper, Nevada Con., or Kennecott, and later in Chile, but, instead, the Guggenheims, although they were officers of A. S. & R. Co., and in receipt of large salaries therefrom, took these opportunities for themselves.

"In the case of Utah the amount expended by the company to build a smelter to treat the ore was greater than the Guggenheim investment in the mines, but the great profit has not come to A. S. & R. Co. Utah has paid $101,000,000 in dividends, it has a surplus of over $49,000,000 and the ore reserves are 368,000,000 tons. It is the most profitable mine in the world.

"Nevada Con. and its plant and railroad could easily have been financed for account of A. S. & R. Co. It has paid dividends of $45,000,000 and has a surplus of $8,000,000.

"The Bonanza properties in Alaska were obtained in 1906 for a moderate investment well within the financial ability of the A. S. & R. Co. This has become the Kennecott, which is a $117,000,000 corporation which has already distributed over $49,000,000 in dividends.

"Chile Copper was obtained about the year 1911—it is the greatest mine in the world. An initial expenditure of about $200,000 by the Guggenheims through their Chile Exploration Co. confirmed an enormous tonnage, which they at once capitalized at $110,000,000.

"Had these four properties been taken over for account of the American Smelting & Refining Co., as they should have been, the stock of the com-

pany would have been worth many times what it is today.

"In the statement issued by President Guggenheim, Jan. 20, it is indicated that the American Smelting & Refining Co. did not participate in the above-mentioned ventures because they were 'distant and hazardous enterprises.' This amazing and misleading statement is made in the face of the fact that while this company was deprived of the opportunities above indicated, the Guggenheims unloaded on the company various mining properties in Mexico and other distant places and took from Smelters about $22,000,000 in cash and its equivalent, but the return to A. S. & R. Co. has been an utterly insignificant sum compared with the profits the Guggenheims derived from the four copper properties mentioned.

"Recently the agency for the sale of copper from the mines of Utah, Nevada Con., Chino, Chile, Braden, Ray, Beatson, and Kennecott was transferred without consideration from A. S. & R. Co. to Guggenheim Brothers, thus depriving the company of commissions of over $1,000,000 a year.

"The attempted explanation fails utterly in the light of the language of the contracts which fully protected the A. S. & R. Co. if President Guggenheim and his brothers had but observed the terms and refrained from gambling in copper."

In the letter dated Feb. 26, Mr. Eilers says:

"A weekly paper entitled the *Financial World*, published in New York, has issued a prospectus announcing a series of articles which it proposes to publish beginning Feb. 28, purporting to be an independent review of the history of the American Smelting & Refining Co., and an independent and unbiased judgment regarding a movement on the part of several thousand owners—in their own names—of stock of the company who demand representation upon the directorate in order that they can have a share in the management, the conservation, and protection of their property.

"Note:—These stockholders are not making an attack upon their own corporation. The attack is upon Guggenheim management. It is a case of stockholders versus Guggenheim domination.

"The independent and unbiased character of the subject matter which it is proposed to print and mail to stockholders, and likely to bankers, brokers, and newspapers pretty generally, is a matter of grave doubt.

"The envelopes addressed to the stockholders, containing the prospectus mentioned, were addressed on the addressing machine of the American Smelting & Refining Co.

"The reproduction of the addresses on the envelopes and the stencils of the American Smelting & Refining Co.'s addressograph show them to be exact duplicates.

"This coincidence leads to the suspicion that the independent and unbiased subject matter to be printed, in four issues, was prepared in the offices of the company, and will reflect the selfish opinions of the Guggenheims who are using every means in their power and every subterfuge to continue their strangle-hold on our company.

"If the Guggenheims are truly conscientious and are eager for you to know the truth, let them tell you over their own signatures—

1.—Why they sold their $35,000,000 of stock?

"2.—Why they withdrew this vast sum and ceased to give the company their financial support?

"3.—Why they failed to turn into the company the great copper mines which they took for themselves?

"4.—Why they turned into their Kennecott Copper Co. their stock holdings in the Utah Copper Co., and caused the American Smelting & Refining Co. to buy their less desirable mines and pay them $22,000,000 therefor?

"5.—Why they caused a mortgage of $31,000,000 to be placed ahead of your preferred and common stocks in order to retire an inferior stock of a subsidiary corporation?

"6.—Why the quick assets of the company per $100 of capitalization have not increased in fourteen years?

"7.—Why the common stock has failed to receive more than an average of 4½ per cent?

"8.—Why the Guggenheim Brothers took over the copper selling agencies which had netted the company more than $10,000,000 in eight years?

"9.—Why the stocks of the company are selling today below the level of twenty years ago, when they first entered 'Smelters' and after twenty years of Guggenheim management?

"10.—Why according to latest record furnished us they own in their own names no more than 324 shares out of 1,100,000 shares outstanding, and still insist upon dominating the company?

"11.—Why they have failed for years to allow representative stockholders to be elected to the directorate?

"12.—Why they carry stock in the names of brokers and other individuals instead of in their own names?

"13.—Why they address you in the names of other people, and anonymously through newspapers and magazines?

"See how these vital questions are discussed or answered in the forthcoming series or articles inspired but not vouched for by them with their own signatures!

"Respectfully,
"KARL EILERS."

Tax on Iron Ore Royalties Proposed

Another method of taxation to derive money from the iron ore mined in Minnesota has been recommended by the House Committee on Taxes of the Minnesota Legislature. This bill as presented would tax royalties on iron ore on a basis of 5 per cent. Many arguments have been presented against the bill.

A Letter From Rio Janeiro

Market for Iron and Steel Small in Brazil—Export Situation Bad—Refusal of Merchants To Accept Shipments Has Injured Credit Greatly

BY MARK R. LAMB

Statistics show that the consumption of iron and steel in Brazil is approximately equal to that of Los Angeles County, California. Nevertheless, it is proposed to build blast furnaces, plate and bar mills, equipment for the manufacture of bars, tin plate, structural steel, rails, and in fact, everything that Brazil consumes in the way of iron and steel. The smallest practical plant for the manufacture of any of these items would produce in one day sufficient for Brazil for the year.

Manganese and Brazil go together. A walk along the docks at Rio will show important quantites awaiting shipment. One lot is warehoused in the customs house. It has been in storage since the beginning of the war, when Brazil took over the German ships, first unloading them. It has taken a great faith on the part of the owners of this manganese to continue paying storage, as such charges increase seriously after the first month. They are now paying the tidy sum of 5,000,000 reys per month on 4,000 tons.

Diamonds are offered the innocent traveler in Brazil with the tempting bait that it is easy to smuggle them back into the States with a sure profit, since prices there are higher on account of the heavy import duty. For the ordinary buyer, prices are no lower in Rio than in New York. Besides this, the unknown seller must be terribly tempted to exploit the ignorance of the buyer. It is surprising what bargain hunters will buy, thinking they are getting diamonds. These innocents will proudly hand you their latest purchase for approval, and when it is actually a diamond it is frequently off color and chipped or else flawed. The defects, though plainly visible to the naked eye, are for some reason invisible to ordinary people, who consider themselves incapable of passing even a superficial judgment on the mechanical condition of the gem. It would be a crime to undeceive them, even if one of them was a famous mining engineer!

DIAMOND FIELDS PECULIARLY SITUATED

The diamond mines are not far from here by train, but Rio is a very long way from the mines on foot, over woods and jungle and swamps. The bravest Brazilian will not attempt it. This peculiarity of being nearer in one direction than in the other is of considerable importance and use to the port authorities. After a sailor man of any nationality becomes known as a confirmed and incurable beachcomber, the authorities are likely to become so exasperated with him that they take extreme measures. These consist of giving him a free ride on the train to the diamond mines, where he can easily (and necessarily, if he wishes to con-

tinue to eat) secure a job. This job does not pay particularly well, and liquor is easily obtainable, so that it is a long, long time before our hero saves enough for his fare to the port. He not infrequently decides to stay, and at least temporarily improve the race.

A similar incident happens in the routine of running ships out of Rio. Recently one steamer carried a number of unintroduced passengers, namely, forty-two stowaways. It can be imagined that the mate was angry, as it meant demoralization of his crew, and there was not nearly enough work for all of them. Besides, it was necessary to feed them more or less, up and back, as only American stowaways are permitted ashore in New York. Cape Frio is some distance north of Rio. It seems close when the journey is made on the ship, but to be put off in a row boat to walk back is extremely disconcerting and quite invariably results in strong protests.

Unemployment Appearing in Some Parts

Owing to the reduction in the market values of many of the products of Brazil, unemployment is making its appearance, and has resulted in an important increase in the production of gold, black diamonds, borts and the gem stones. The production of the latter is of course negligible as compared to that of South Africa, but nevertheless constitutes an important element in the economic life of Brazil.

We hear strange tales here of the American paper money being at a premium in B. A. It is said that the officers of the ships are employing their capital very profitably, turning it over every trip with a profit of from 5 to 10 per cent. It is prohibited to export anything but very small quantities of gold, yet it is at a discount—probably for that reason. If it is really true, you may cable your remittance and I will go fifty-fifty with you on the profit. Sounds like Ponzi, doesn't it? Will have more of this to tell you from Buenos Aires.

Export Situation Bad and Credit Ratings Damaged

The docks here at Rio are running over with merchandise shipped in from all parts of the world, much of it refused by the buyer, delivery of much of it refused by the seller. It is not fair to generalize regarding the situation, though it is possible to say "as between North and South America, the former has not acted correctly: and as between American exporter and Rio buyer the latter has not acted correctly." Each case must be decided upon its merits, and it is for this reason that many houses here which formerly enjoyed the highest credit rating are going to have very black marks against their names. The excuse for non-acceptance is low prices and bad exchange rate. These are not of the slightest value as reasons for refusing to pay, unless we are to have a new system of business morality. The bank managers and the managers for Dun and Bradstreet are emphatic in saying that the credit of a firm will hereafter be judged exactly the same as heretofore. All credit information from whatsoever source is now prefaced by the statement, "That information is two months old—too old to be of any service except as a general guide."

It is not possible for an exporter to force a shipment on a reluctant buyer unless the former has been extremely fortunate, and has such a clear case, with all stipulations in writing, that there is no escape for the buyer. The Chamber of Commerce is doing a great work in making settlements. Curiously enough, the best of its work results, not from arbitrations, but rather from settlements made before that point is reached.

The banks of all nationalities are doing a very good work in constantly calling attention to the fact that credit ratings are often injured much more than the value of the shipment in dispute. They are firm regarding renewals, some going so far as to refuse a renewal unless the acceptee of the draft first deposit the value of the draft in milreis at the exchange of the day, the balance or difference either way, at due date, to be adjusted according to how exchange has varied.

Equipment of English Make in Evidence

All the equipment on the docks here is of English make. There are scores of cranes of light capacity and long reach, which can discharge from ship or lighter to the platform of the warehouse. The equipment is light throughout—light locomotives, small cars of the European pattern with four wheels and light enough to be pushed by one man. The negro porters work with extreme economy of effort, but in their place on these hot days so would anyone work.

There are forty ships waiting their turn to reach the dock or to secure lighters for unloading. These freighters cannot afford a dock of their own, so are compelled to wait.

The strange point about the entire export situation is the fact that the larger the exporter, the worse he is hit. The most fortunate, both among importers and exporters, are those whose ratings were low, who had few connections abroad or who were too conservative (or afraid) to take risks of any kind, and who confined their operations to orders based on letters of credit. If they continue this practice, they will be wise. It will be a long, long, *long* time before it will be safe to give sixty days to Brazilian importers *en masse*, and it will take many more months of bankruptcies to prepare the list of acceptable credit customers. It is much better to close the office, play golf and live on capital, than to distribute capital as loans to insolvent merchants.

Long live the export business, but only the nice, clean, letter-of-credit export business.

Idaho Mining Association Meets

Wants Tariff Protection for Lead and Zinc—Would Repeal 640-Acre Homestead Law

At the recent annual meeting of the Idaho Mining Association at Boise a resolution was adopted favoring the repeal of the 640-acre homestead law for the reason that in its operation land that is chiefly valuable for mineral is taken up and patented, and it not infrequently happens that mineral locations under development are included in these enlarged homestead entries, since no record of mining locations is required in the government land offices. The executive committee was authorized to employ counsel and contest the validity of the law.

The advance in railroad rates was condemned and mine operators and railroad companies were urged to get together and adjust rates on a basis that would insure a continuation of mining operations.

The association declared in favor of a tariff rate of 2c. per lb. on imported lead in all forms and a duty on zinc in accordance with the recommendation of the American Zinc Institute.

Among other resolutions adopted was one in favor of the McFadden Gold Bonus Bill and calling on the Idaho delegation in Congress to support it, making Sept. 1 the end of the year as far as assessment work on mining claims is concerned; providing for displaying in the capitol building the mining exhibit of Idaho that was shown at the Panama-Pacific exposition; calling upon the legislature for a continuance of support of the state bureau of mines and geology; urging the legislature to raise the salary of the mine inspector of the State of Idaho to $3,000 and make more liberal allowances for the maintenance of his office.

The old officers were re-elected as follows: Jerome J. Day, of Wallace, president; J. B. Eldridge, of Boise, vice-president; Ravenel Macbeth, of Mackey, secretary and treasurer.

Salt Lake-San Francisco Rate Hearing in Progress

The hearing before the Interstate Commerce Commission in regard to the reasonableness of the rate of $6.50 a ton recently granted by the Western Pacific railroad from Salt Lake to San Francisco is being watched with interest by Salt Lake mining and smelting men. Copper producers of Salt Lake City and vicinity were recently cross-examined to show the rate was both reasonable and remunerative to the carrier. By shipping to San Francisco and from there via the Panama Canal to the refineries at Perth Amboy and Baltimore, Md., a saving in freight can be made.

Cerro de Pasco produced 4,086,000 lb. copper in January. as compared with 4,258,000 in December.

Old Dominion produced 2,655,000 lb. copper in January against 2,822,000 in December.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tariff on Cyanide Vigorously Opposed

Would Cause Further Loss to Producers of Gold and Silver Ores Requiring This Chemical

Application by the Roessler & Hasslacher Chemical Co. for a tariff of 33⅓ per cent ad valorem on cyanide has brought out the most determined opposition to any such proposal. It is declared that such a rate of duty will give a monopoly to this company and will place a great burden on the mining industry.

It was pointed out to the committee that the great development in the extraction of gold and silver from their ores has come by the use of cyanide. It was declared that it has made possible the profitable working of low-grade ores and the creation of a great industry that had not existed until this method of recovering increased percentages of gold and silver had been devised. Prior to 1917, it was alleged that the mining industry in the United States "was at the mercy of a great foreign combination originating in Germany." In that year, competition was undertaken by another company operating plants at Niagara Falls, Ont., and at Warners, N. J. It was declared that this competition has saved the mining industry large sums.

Attention was called to the fact that cheap cyanide is of the greatest importance, especially at this time when gold and silver mining is in a precarious condition. In the Tonopah district, it was stated, 2½ lb. of cyanide extracts 15 oz. of metal in the average ton of ore. It was pointed out to the committee that 20,000 men are employed in gold and silver production, where the cyanide method of recovery is in use. These men, as well as employees of allied industries would be adversely affected were there to be any further decline in gold and silver mining. Such a condition certainly would result, it was declared, if this high rate of duty were enacted into law. Should the Payne-Aldrich tariff bill be reenacted, as now seems possible, sodium cyanide would be on the free list, but cyanide of potassium would be dutiable at 25 per cent ad valorem. Each is on the free list in the existing (Underwood) tariff act.

During January the Geological Survey reported upon the geological structure involved in 426 applications for prospecting permits under the oil sections of the Mineral Land Leasing bill. This brings the number of these reports rendered since July 1, 1920, to more than 3,600.

More Liberal War Minerals Bill Passed by Senate

House Unlikely To Consider Measure —As Precedent, May Be Helpful at Extra Session

The Senate on Feb. 24 passed a bill which would make possible a more liberal interpretation of the "request or demand" feature of the War Minerals Relief Act. Before passing the bill the Senate eliminated a provision that the law "shall be liberally interpreted." Senator Smoot contended that there is only one way to interpret the law and that is to interpret it correctly.

The bill, as passed by the Senate, provides that claims will be considered whenever a personal, written or published request or demand originated in the Government.

Since there is not one chance in a thousand of securing action on the bill by the House the Senate's action in this respect will have no influence on the existing war minerals relief situation, although it constitutes a precedent which will be helpful if new legislation along this line is acted upon during the extra session.

Tungsten Tariff Measure Fails

Senator Henderson, of Nevada, made an unsuccessful effort on Feb. 24, to take up the bill providing increased duties on tungsten. The Senate quickly passed the measure over, however, when Senator Thomas, of Colorado, stated that he was prepared to speak in opposition to the bill throughout the remaining time of the session.

Urges Development of Potash Industry

Development of a domestic potash industry is recommended strongly in a communication to the Senate by the Chief of the Bureau of Soils. It is pointed out that during 1920 there were large imports of potash.

Few Bids for Government's Brass

The Director of Sales is having great difficulty in securing a purchaser for the 48,000,000 lb. of brass cartridge cases which the War Department has declared surplus. Only four bids were received at the last attempt to find a purchaser, and one of those did not comply with the regulations and was thrown out. The high bidder was the Hess Briggs Corporation, New York, but that company withdrew its bid before an award was made. Bids by the International Minerals & Metals Corporation, of New York, and the Standard Iron & Steel Co., of New Haven, Conn., were rejected as being too low.

Attack on Baruch and Copper Men Arouses Defenders

Illinois Representative's Extravagant Remarks Elicit Many Replies— President Vindicates Ryan

There was another outburst in the House of Representatives last week aimed at Bernard Baruch and John D. Ryan, as well as at the copper producers. Charges, preferred by Representative Mason of Illinois, were couched in sensational phrases and many extravagant allegations were made. When called upon for proof, Mr. Mason said that the proof of Mr. Baruch's wrongdoing was his own conduct.

President Wilson flatly denied the charges made by Representative Mason. In a letter to Representative Garrett he branded them as "utterly foolish." He said:

"There was not a suggestion of scandal connected with either of these gentlemen in any of the war activities in which they played so important a part, and I wish, before the closing days of this administration, again to say how admirably they served the needs of the nation and how unselfishly they devoted their fine talents to the Government in every crisis which faced us during the critical days of the war.

"As a matter of fact, Bernard M. Baruch and John D. Ryan, whose names have been linked with irresponsible gossip in connection with the fixing of the price of copper, had nothing whatever to do with the price fixing negotiations, which finally resulted in the statement I made fixing the price, either at the time the price was fixed, or subsequent thereto.

"Judge Lovett acted as chairman of the committee which considered the first price fixing of copper, and after due consideration recommended to the President, in September, 1917, that he had fixed the price at 23½c. per pound on condition that the wages of the employees of the copper producing companies should not be reduced below the then prevailing price, which was based on 27-cent copper.

"A year later a readjustment of the price was made necessary by an increase in the railroad rates and costs of supplies, and after negotiations which extended over many months a further increase was recommended by Robert S. Brooking, chairman of the War Industries Board. Neither Mr. Baruch nor Mr. Ryan had any part in these negotiations, which resulted in the fixing of the price announced by me."

The discussion led Representative Garrett of Tennessee to say:

"The proof shows that Mr. Baruch

did bring about an arrangement whereby there was purchased for the Navy and War Departments 45,000,000 lb. of copper, at 16⅝c. per lb., the average price for the last ten years, when in the markets of the world and the United States copper was selling at from 26 to 33c. a pound; and that was all he did."

This remark brought forth prolonged applause.

The attack on Mr. Baruch in the House led Senator Thomas, of Colorado, to go exhaustively into the defense of Mr. Baruch and Mr. Ryan in an address on the floor of the Senate. A bit of unwritten history was brought out by Senator Thomas, when he said:

"It so happened, Mr. President, that in 1917 my attention was drawn to an agreement which had been entered into between Mr. Baruch, as chairman of the War Industries Board, and representatives of the copper industry of America, some time during the early summer of 1917, which fixed the price for Government consumption at 16⅝c. per lb., as against the then prevailing rate of over 26c. per lb.

"That arrangement, while beneficial to the Government, which had become the great consumer, threatened to close a number of small mining concerns which were making a small profit at the prevailing price, owing to the enormous increase in the cost of production. One of those mines was situated in the State of Utah, and, being requested by Mr. Smoot, the senior Senator from that state, to accompany him, we interviewed Mr. Baruch, calling his attention to this drastic consequence of the fixation of that price for copper.

"A few great companies would profit, not unduly, but profit considerably, under that arrangement, while a number of small concerns would necessarily go to the wall, and it was that condition, Mr. President, quite as much as any other, which resulted in a subsequent elevation of the price to a point under which the smaller producer could exist. The Senator from Utah, well posted regarding the industry, laid the facts and figures before the chairman, who reluctantly acknowledged their correctness. As a matter of course, he could not establish one price for the large and another price for the small producers."

NEWS BY MINING DISTRICTS

AUSTRALIA

Base Metal Industry of Commonwealth Hard Hit

Melbourne — The Australian base metal industry has been hard hit by recent falling markets and a total or partial cessation of operations is general. The Hampden-Cloncurry company, in Queensland, has closed down the McGregor group of mines, which are too low grade to be worked profitably at present prices. Operations at other mines have temporarily ceased with the exception of a little development work. The Broken Hill Associated Smelters at Port Pirie, South Australia, have closed down and it seems inevitable that the Wallaroo & Moonta Mining & Smelting Co. will follow suit.

The position in Victoria and South Australia is aggravated by the strike of marine stewards which is preventing the transport of New South Wales coal to these states. The Victorian situation is made worse by the fact that the state black coal mine at Wonthaggi and the brown coal mine at Morwell are closed down, the men being on strike in consequence of the State government's refusal to accept the award of the Hibble tribunal appointed by the Prime Minister, Mr. Hughes, under the Industrial Peace Act, one of his recent hobbies. The general opinion is that if Mr. Hughes persists in interfering between employers and employees Australia is likely to lose her present status as "a land wherein industrial peace sometimes breaks out" and become a center of perpetual strife.

Tasmania

Electrolytic Zinc Co.'s Test Plant Shut Down

Risdon—The Electrolytic Zinc Co. of Australasia, Ltd., which had intended to continue running its 10-ton plant until the larger one was ready to begin operations, has been nonplussed by the metal market slump and ceased productive operations temporarily at the end of the year.

Construction of the large plant will continue without material alteration, and the board of directors has authorized the management at Risdon to confer with the co-operative council and the works' committee to obtain their views as to the distribution of employment, particularly as affecting employees with dependents and those of long service with the company.

The first half of the large plant will be completed before the end of 1921. The start-up of operations on this unit is necessarily dependent upon the completion by the hydro-electric department of construction work at the Great Lake, the Ouse, and Waddamana, to enable that department to deliver at that date the 15,000 hp. which is part of the 35,000 hp. contracted for with the Tasmanian government.

Queensland

Government To Market Sapphire Output in Europe To Stabilize This Industry —Gold Output Drops

From Our Special Correspondent

Brisbane, Jan. 25—With a view, if possible, to stabilizing the sapphire mining industry of Queensland, the Government has entered into an agreement with Rubin Brothers, of Bombay, Paris, London, and elsewhere, for the marketing of the gems in Europe. The intention is for the Government to secure the whole of the output (except fancy stones) of the Anakie sapphire mines, advance to the miners 75 per cent of that output based on the estimate of a grader on the field, and then sell through Rubin Brothers, who are to get a commission of 5 per cent, paying the miners the balance of the purchase money, less charges, when the gems are sold. That firm is, in the first instance, to provide the money for the advances. The ups and downs of the market have in the past seriously affected the industry. For instance, things were very prosperous on the field at the beginning of last year, but a few months later prices went down and many left the district. It is hoped that the new arrangement will lead to their return, and that the mining community there will in future become more settled and prosperous.

Official returns of the gold yield of Queensland for 1920 are not yet complete, but approximately the output is given as 114,180 oz., valued at £485,000 —a decrease, when compared with like returns for 1919, available at this time last year, of 6,700 oz.

The Bamford State Battery is now at work, treating tin only.

The Wonbah molybdenite mine, described by a Queensland government geologist, J. H. Reid, in *Engineering and Mining Journal* for Nov. 13, 1920, p. 947, has been closed down for several months, owing to the low market price for the metal. Mr. Reid said the mine is not only of extreme geological interest but is the premier molybdenite mine in Queensland and apparently also in Australia. It will therefore no doubt be reopened when prices again improve.

CANADA

British Columbia

Trail—During the week ended Feb. 21 the Consolidated smelter received 8,565 tons of ore from the company's mines, 95 from the Horn Silver at Similkameen and 5 tons from the Nip & Tuck at Sandon.

Sandon — Although the Silversmith mine is in excellent shape to start production, the management does not evince any intention of beginning milling operations soon. It is hinted, instead, that the force, which now num-

bers between 30 and 40 men, may be further reduced.

The Dunsmuir estate, owning the Noble Five group, has taken up the bond held on a number of adjoining claims, the option being secured by the late James Dunsmuir over two years ago from the Harris & Kelly interests. Operations at the Noble Five mine and mill will not be resumed yet, it is stated, and it is believed that an effort will be made by the Dunsmuir interests to dispose of the entire property, including the additional ground acquired under bond.

Alamo — Clarence Cunningham returned recently from New York, where he is reported to have secured capital for additional development of the Queen Bess mine and other properties in which he is interested.

MEXICO

Hidalgo

Engineers Investigating Failure of Xotol Dam Said To Have Reported

Pachuca—The committee of engineers commissioned to investigate the cause of the breaking of the Xotol dam here on Jan. 19 have rendered their report, attributing responsibility for the catastrophe to carelessness on the part of the Maravillas Mining Co., according to reports from Mexico City.

Coahuila

Torreon—Louis de la Mora and associates have denounced a group of twenty pertenencias to be known as the Ampliacion de la Alianza, in the Nazas district. Samples taken from several prospect shafts which have been sunk along the vein assay well in copper and silver. Other copper mines of the Nazas district are preparing to resume after being closed down for several months. The ores from these properties are shipped to the Torreon or Velardeña smelters.

Mining is becoming very active in the Ramirez Mountains of the San Juan de Guadalupe district since the Torreon smelter has blown in. The ores from this district run high in silver and lead with a large percentage of lime.

CALIFORNIA

Operators More Optimistic Over Improved Conditions — State Legislature Gets Numerous Mining Bills

San Francisco—A greater abundance of labor is acting like a spring thaw upon a persistent snow bank in dispersing the chilly blanket of pessimism that has covered the mining industry of California for some time past. Increasing efficiency is also helping to brighten the gloom which is being gradually dispelled. Mining men are getting a fresh grip, and the upturn of the industry is believed to be here.

Many bills of interest to mining men have been introduced in the present legislature of California. Among these is Senate Bill No. 10, which is intended to provide a mining and metallurgical experimenting station at the mining building of the University of California as well as an appropriation of $20,000 for the purpose. This bill is like many of a similar nature. It promises an elaborate campaign of research in the mining industry. If it goes through, the mining industry of California will be more than amply served by the State Mining Bureau, the U. S. Bureau of Mines and the U. S. Geological Survey, and the new laboratory.

Assembly Bill No. 1116 is an act to provide for the organization and government of mining districts and to provide for the acquisition or construction of transportation systems for such districts. The bill provides for the incorporation of a mining district with power to purchase, construct and operate railroads, pipe lines and other means of transport. This is an elaborate and impractical plan as it presupposes a degree of co-operation of political and commercial agencies that will be almost impossible to attain.

Senate Bill No. 922 is a bill to reserve all minerals in state lands and to provide for classification, the granting of permits and leases to prospect and the royalties to be paid. This legislation is derived no doubt from the Federal leasing law and is distinctly experimental.

Assembly Bill No. 1102 provides an appropriation of $30,000 for the construction, renewal and repair of works for controlling debris resulting from mining operations. It is contingent upon the Federal Government providing a like appropriation. Its administration would be under the California Debris Commission.

Assembly Bill No. 198 would fix eight hours as a standard day, and time and a half for overtime, and double time for Sunday labor. As the bill does not recognize competitive conditions in industry, it falls into the group of unwise legislation.

Assembly Bill No. 501 provides for a more general observance of Sunday as a day of rest. It would operate to prevent operation of mines and mills on Sunday and would thus increase overhead charges in the mining industry. It is not viewed with enthusiasm by operators.

Jackson—The Kennedy mine is unwatering at a rate of 500,000 gal. per day against an inflow of approximately 75,000 gal. per day. Substantial progress is being made.

At the Argonaut a cave between the 3,900 and the 3,700 levels has been caught up and unwatering resumed.

Central Eureka and Old Eureka at Sutter Creek, the Fremont at Dry Town and the Bunker Hill at Amador City, as well as other properties are operating good working forces or preparing for increased activity. Local reports credit the Old Boston property near Mokelumne Hill with preparations for increasing milling capacity from 250 to 1,000 tons per day.

NEVADA

Tonopah Dividend To Be Reorganized on Assessable Basis

Tonopah—In the Tonopah district the Belmont is producing about 400 tons of ore per day, Tonopah Extension 230, West End 200, Tonopah Mining 200; with a more or less regular production from the Rescue, California, North Star, Midway, and Montana amounting to perhaps 75 tons per day more.

A lessee in the Montana Tonopah has recently cut what may prove to be an extensive body of high-grade ore. At one point the ore is 12 ft. wide. The leasing system, as used in some of the mines of this district, has proved very remunerative from a company viewpoint, this being especially true where the veins are small and mill tonnage hard to maintain. The Tonopah Extension has completed preliminary work on the 1,540 station of its McCane shaft and sinking has been resumed.

Divide—The Tonopah Divide company reports no change in the conditions in the southeast faces of the drifts on the 800 and 1,000 levels. Developments on upper levels are normal and the 50-ton daily ore shipments are being maintained.

The Tonopah Dividend, which owns ground northwest of the Divide orebody, is to be reorganized on an assessable basis to provide funds for further development. This is one of the few companies which has been working practically steady since the discovery of the Divide district. The Knox Divide, which has purchased the Golden State mine in the Klondike district, is shipping about 25 tons per day from that property.

Pioneer—The management of the Consolidated Mayflower mine at Pioneer has announced that milling will be resumed on March 1. There is plenty of ore of milling grade in both the Mayflower and Starlight workings, with good possibilities for high-grade developments. The Mayflower shaft is to be sunk to water level, estimated to be at about 800 ft. depth.

Silverhorn—Weir Brothers & Co., of New York, has recently become heavily interested in the new Silverhorn district near Bristol and associated with them are a number of New York and Tonopah mining men. Active work is now being done by the Navada Silver Horn Mining Co., on the big upstanding ore dike, and already a strike of much importance has been made which greatly enlarges the profitable ore zone. At a point a hundred feet to the north of the United States Mineral on the Horn Silver No. 1 claim and distant at least 150 ft. from the sectors recently sampled by T. H. France and engineers representing the New York interests, C. E. Blount, superintendent of the mine, discovered high-grade silver ore. Sectional sampling of this important discovery gave assays which averaged over an area ten feet square, 32.7 oz. silver with 60c. gold.

Pioche — Ore shipments from the Pioche district for the week ended Feb. 17 totaled 2,270 tons. Shippers were as follows: Virginia Louise, 955 tons; Prince Con, 915; Black Metals, 150; Bristol, 200; and Con. Nevada-Utah, 50.

W. E. Brodie, who recently secured a lease on the slag dumps of the two old Pioche smelters, shipped the first car to the American Smelting & Refining Co., at Salt Lake City, last week.

Shipments of silver-lead-zinc ore from the Combined Metals mine will be started immediately.

Ely—Another substantial cut in the payroll of the Nevada Consolidated Copper Co. has been made, and only about 30 per cent of the men formerly employed by the big company are still on the payroll. Operations at the mines at Ruth and at the mill and smelter at McGill have been reduced to a minimum. Married men have been retained wherever possible and there are now hardly any single men on the payroll.

Other mines in the Ely district are working on a small scale and shipments have practically ceased.

IDAHO

Cœur d'Alene District

Independence Lead May Resume Operations After Long Idleness

Mullan—After being idle several years there are indications that the Independence Lead Mines Co. will soon be active. A few men are now engaged in retimbering the main tunnel. The Independence joins the Morning on the east and extends almost to the Hunter, presumably including one or more of the great orebodies which have made those mines productive for many years. It was acquired by the Stewart Mining Co. at the time the late F. August Heinze was the dominant figure in the Stewart. M. W. Bacon, formerly manager of the Stewart, is now a large stockholder, as is also Harry L. Day.

WASHINGTON

Okanogan Valley Power Co.'s New Plant Completed, Assuring District Ample Power Supply

Oroville—The stability of the domestic silver market is being reflected in a renewal of mining activity in the Oroville-Nighthawk district of northern Okanogan County, Washington. The Okanogan Valley Power Co. has completed its new power plant at Similkameen Falls and the mines of the district can now be assured of a continuous power supply. There has been an exceptionally heavy snowfall in the mountains this winter and the smaller companies are waiting for the spring thaw before resuming operations.

The Pyrargyrite Mining Co. has its new 75-ton concentrator ready for its first run and is awaiting power. This mill is a modern installation.

The Four Metals Co. is planning to erect during the summer a 75-ton concentrator for treating silver-lead-copper ore. After two years of consistent development work this company has its property in an excellent physical condition.

The Kaaba Mines Co. has completed 630 ft. of drifting on the 200 level; all of this work is on a large medium-grade quartz vein. During the summer it plans to deepen the shaft to the 400 level and lower levels run to block out the ore. The Lone Pine company has kept the two men at development on its property during the winter.

Conconully—In the Ruby-Conconully district the Arlington mine has closed down temporarily on account of the deep snows hampering operations. It will resume shipments early in the spring. A road has been broken through the snow as far as the Last Chance mine and occasional shipments are being made from that property.

Northport—The Electric Point mine, Washington's major lead producer, closed down last month to await a more favorable market. The management prefers to hold a large tonnage of ore in stock at the lower tram terminal, rather than accept the present price for lead.

Index—The Sunset copper mine in the Index district has also suspended and it seems that the only production that can be expected during the next few months will come from those mines which have an appreciable amount of silver in their ores.

MICHIGAN

Menominee Range

Operations Slow at Iron County Mines

Crystal Falls—Mines at the east end of Iron County are operating at a slow pace. At the Odgers one group of men works two weeks and then lays off two weeks that another set may find employment. A new level is being opened and the shaft will be continued 80 ft. below this and an ore pocket and crusher installed.

At the Carpenter and Monongahela one shift is working without change throughout the month.

At the Balkan and Judson mine forces have been reduced to the minimum.

At the Amasa-Porter and Warner a slightly larger number of men are employed. At the Warner a new shaft is being sunk that will take a year to finish.

Wells—The furnace and chemical plant is to be started as soon as a working force of men skilled in this work can be secured.

Gogebic Range

Steel & Tube Co. at Ironwood Cuts Week to Four Days—Accident at Pabst Kills One

Ironwood—The Steel & Tube Co. of America, operating the Anvil-Palms and Newport mines and the second largest operator on the range, reduced operations to four days per week starting Feb. 24. It had previously reduced forces and wages considerably.

The Republic Iron & Steel Co. has also reduced work at its mines, the Townsite now being on a three day per week schedule.

A fatal accident occurred at the Pabst mine Feb. 23 in what was apparently one of the safest stopes in new ground where there was little "weight." A post broke suddenly, letting a lot of fine run through the lagging and burying a miner, who was suffocated.

MINNESOTA

Mesabi Range

Inland Steel Defendant in Two Suits

Hibbing—The Inland Steel Co., operator of many large properties on the Mesabi Range, is named as defendant in two suits, one involving $157,916 damages and the other for $212,500.

The actions involve certain tracts of iron bearing land in Minnesota which were leased by George H. Crosby as agent for the plaintiffs to the Inland company. The plaintiffs contend that the properties were not mined as per contract and that owing to the operations conducted a certain amount of ore was lost and that the property was also damaged by the methods of mining that were used.

The blacksmith shop and several small buildings of the Laura mine, a property of the Inland Steel Co., were burned last week. The fire spread very rapidly, endangering for a time all the buildings at the plant.

NEW YORK

State Ranks High as Producer of Non-Metallic Minerals—Several Iron Ore Companies Operating

Special Correspondence

The products of the mines of New York State, in order of value, are magnetic iron ore, rock and evaporated salt, gypsum, graphite, zinc, garnet, talc, pyrites, hematite iron ore, feldspar, granite, and marble. Production during the last year was about normal, with some slackness at the close and increased stocks on hand. New York is the largest producer of clay products in the United States and ranks high in its output of portland cement.

The operators producing magnetic iron ore are: The Chateaugay Ore & Iron Co., with mines at Lyon Mountain. This low-phosphorus ore is smelted at Standish furnaces. A program of extensive development is being successfully carried on under the supervision of J. R. Linney. It is planned to deepen the main hoisting shaft to the 1,200 level at once. The rolling formation of this great orebody calls for more than one method of mining. Milling is adopted where the formation is favorable, and the room-and-pillar system elsewhere.

At Mineville, Witherbee, Sherman & Co. are operating the Barton Hill or New Bed, a continuation of the old Orchard mine, the ore being low in

phosphorus and coarsely crystalline, and the Harmony mine, the ore here being somewhat similar to that of Barton Hill, and in which the lens is of great size and apparently extends and connects with the Barton Hill orebody and resembles it in appearance. South of this, and pitching under it at depth, is the ore bed known as Lower Old Bed. Both mines are connected at depth. The mines have the most up-to-date electrical equipment. Continuous prospecting by core drills and the steady, well-planned development work extending over several years have brought good results. The introduction of electric shovels and other mechanical loaders in these deep mines has kept costs down, and, notwithstanding the scarcity of labor, production has been maintained.

The Port Henry Iron Ore Co. operates two mines, the Clonan and the Welch. Both mines are electrically equipped, and considerable development work is being done in the former. The shaft has been deepened 300 ft. to reach the Lower Old Bed, which is identical with the Lower Old Bed of Witherbee, Sherman & Co.

The Fort Montgomery Iron Corporation, 20 Vesey St., New York, operates the old Forest O'Dean mine, about six miles west of West Point. The ore is of very high grade. In form it is a heart-shaped chute dipping about 19 deg., with hardly a degree of variation for over 4,000 ft. Its formation and its dip under a mountain limit production by long haulage, which up to the present time is carried on in one stage.

The Ramapo Ore Corporation two years ago acquired the iron property of the Sterling Iron & Railway Co., at Sterlington. The mines are near Sterling Lake, in Orange County, and seven miles from Sterlington. The Lake mine deposit is a lens dipping under Sterling Lake, and is now at a depth of 3,200 ft. This lens has continued to that depth in about uniform width, with indications of splitting on lower floors. The Scott mine is also being electrically equipped, and a 400-ft. vertical concrete shaft has been completed and crosscuts driven to the ore. A test mill has been erected, and preparations have been made on an extensive scale for large production.

Hematite iron ore is mined by two operators. At the Clinton Hematite mines, owned by Mrs. A. Borst, of Utica, the deposit is about 32 in. thick, and it is estimated that the bed, as owned, is about twenty-five square miles in extent. The mine, which is just northeast of Clinton, is worked on the longwall advancing system. The ore is first mined, and then about 2 ft. of slate is taken down and gobbed. Hardly any timber is used. This mine is handicapped by being unfavorably situated for the transportation of the ore to the Pennsylvania market. The ore is 48 per cent sesquioxide, with about 6 per cent lime. Facilities for shipping this ore via the Barge Canal should be obtained to relieve the high railroad freight now imposed.

The other hematite mining operator is the Furnaceville Iron Ore Co. at Ontario Centre in Wayne County, where surface or open-pit mining is used. The ore is about 20 in. thick and the overburden to the south is getting heavier with every cut until it has almost become unremunerative. Much of this ore as well as the Clinton ore is used for making paint.

Salt and Gypsum Products of Importance; Latter Increasingly So

The Retsof Mining Co., at Retsof, and the Sterling Salt Co., at Cuylerville, are the only rock-salt miners in the East. The salt bed is about 80 ft. thick, of which a 9 to 11-ft. layer is of commercial value. The bed is reached by vertical shafts at about 1,100-ft. depth. Both corporations are preparing for increased production by adding to their hoisting facilities, and have electrically equipped the mines.

Gypsum is becoming scarcer and more valuable—scarcer owing to the demand for the material by cement manufacturers, for it acts as a retarder, of which they add 3 per cent to their cement. Gypsum is getting more valuable as the number of gypsum products increase. The principal producers of gypsum and gypsum products are: U. S. Gypsum Co., of Oakfield; Niagara Gypsum Co., of Oakfield; American Cement Plaster Co., of Akron; Ebsarn Fireproofing & Gypsum Block Co., of Rochester, with mines and mills at Wheatland and Garbutt; Lycoming Calcining Co., with mine and mill at Garbutt; Empire Gypsum Co., of Rochester, with mine and mill at Garbutt, and American Gypsum Co., of Rochester, with mine at Akron.

Other corporations preparing for production are the Phœnix Gypsum Co., of Rochester, with a mine being developed at Wheatville, and American Hardwall Plaster Co., of Utica, with a property near Oakfield, on which a shaft is being sunk. The Victor Plaster, Inc., of Rochester, has been organized to develop a gypsum property at Victor, in Ontario County. This is a new territory, claimed to contain 4½ million tons of high-grade gypsum, and it is the company's intention to grind mostly for land plaster and also for the cement trade.

Graphite and Zinc

Graphite is mined by the American Graphite Co., of New Jersey, at Graphite, six miles from Hague on Lake George. This is the source of supply of the Dixon Crucible Co. Frank C. and George Hooper, pioneers of the graphite mining and milling industry, operate a graphite mine and mill about five miles from Whitehall, north of South Bay, Lake Champlain. The product and separation are good, but slackness in the market and fuel scarcity has caused a temporary shutdown, and it is not likely that work will be resumed until spring, 1921. The development of an hydro-electric plant on the property is anticipated.

The Northern Ore Co., at Edwards, in St. Lawrence County, has been a large producer of zinc, with mines and mill about a mile north of Edwards. The New Jersey Zinc Co. built and operated a separator last year at its mine near Talcville, in St. Lawrence County.

Talc, Garnet and Feldspar

Garnet for abrasive purposes is mined by H. H. Barton Sons, of Philadelphia, at the Gore Mountain mine near North River. This is an open quarry in fairly soft rock. The North River Garnet Co. (Messrs. Hooper & Richards, of Glens Falls), North River, mines garnet rock near Thirteenth Lake, six miles from North River. The mine and mill were operated night and day last year. The separation of the garnet is effected in water and is close work, owing to the very slight difference in the specific gravity of the garnet and the rock. About five miles north of North River at Minerva the American Glue Co. erected a mill last year for recovery of garnet from its mine ore.

Talc is mined almost exclusively by the International Pulp Co., of Gouverneur, at Talcville, in St. Lawrence County. The deposit is found in lenses and is difficult to mine. Most of the mining is done by level stoping. The Loomis Talc Co. is mining talc at Little York, near Gouverneur, and its new mill is nearing completion. The Uniform Fibrous Talc Co. is planning to deepen its new vertical shaft so as to reach the ore at depth below the old mine.

Feldspar is mined by Kinkle Sons Co., of Bedford, Westchester County; McLear Bros., at Gouverneur, and the Maco Co. at Wilton. The feldspar of Kinkle Sons Co. is pink. The mill is about four miles from Bedford Station. The McLear Bros. mine is near Old De Kalb, St. Lawrence County. The deposit is about half gray feldspar and gray quartz, and is very extensive. Properly equipped it should be a large producer.

Granite, Marble and Pyrites

Granite is quarried by the Mohegan Granite Co. at Peekskill, the Finch Pruyn Co., of Glens Falls, which quarries a fine quality of black marble, and by George Brothers, of Ausable Forks, who quarry syenite for monumental purposes. The Vermont Marble Co., of Proctor, Vt., quarries some pink-eye marble limestone at Bluff Point, in Clinton County.

The mining of pyrites is limited to the operation of the New York Pyrites Co., at Gouverneur. This mine was developed during the war, and a fine mill hurriedly erected, but since the armistice the demand for pyrites has fallen off. An extensive deposit of 33 per cent ore has been developed, and since the property is newly opened under ordinary conditions it should be remunerative, but at present the market is discouraging.

THE MARKET REPORT

Daily Prices of Metals

Feb.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
24	12.25	28.25	32.25	4.00	4.00	4.80
25	12.25	27.75	31.50	3.90	3.90	4.80
26	12.25	27.50	31.00	3.75	3.75@3.90	4.80
28	12.10@12.15	27.00	30.00	3.75	3.75	4.75
Mar. 1	12.10@12.15	27.25	30.00	3.75@4.00	3.75@4.00	4.75
2	12.10@12.15	26.50	29.25	3.75@4.00	3.75@4.00	4.75

*These prices correspond to the following quotations for copper, "delivered": 12.50, 12.50, 12.50, 12.375, 12.375, 12.375c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
24	70	69¼	73½	168½	171¾	18¼	19	25½	25¾
25	69¼	68¼	73	165½	169½	16½	17¼	23¾	24¾
26	...	...	..	....	....	...	...	...	...
28	68¼	67½	73	159½	163½	17½	18½	23¾	24½
Mar. 1	68¼	67¾	73	152	162	17½	18⅛	23¾	24¾
2	67½	67¼	73	155½	159½	18¼	19	23½	24¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Feb.	Sterling Exchange	Silver			Feb.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York, Foreign Origin	London
24	386	99½	56	32	28	385¾	99½	56¼	33
25	385½	99½	54⅜	31⅜	Mar. 1	387¾	99½	55¾	32½
26	385	99½	54¾	32	2	387¼	99½	54	31½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, March 2, 1921

The week has been exceedingly quiet in all of the metal markets. Copper and zinc have made further declines, but lead, after declining to below 4c., has recovered slightly. The two political factors, the inauguration and the beginning of a new administration at Washington, with the uncertain situation with respect to the amount and terms of the reparation to be exacted from Germany, undoubtedly exert a large measure of influence and are partly responsible for the stagnation in the existing market. Consuming demand is, however, practically nil, and that fact, in the ultimate analysis, is responsible for the condition noted.

Copper

The volume of domestic business transacted in the last week has been pitifully small. Even those producers who are attempting to sell in the market at current prices had difficulty in tempting purchasers. Many producers refuse to enter the market at the present level and are in a favorable position for delaying offerings. Low prices, instead of encouraging buying, have apparently scared away prospective business.

Manufacturers of copper products maintain that dullness in retail trade, cancellations, and the resulting restriction of business are largely responsible for their unwillingness to enter the market at this time. Copper can be obtained for early delivery today at 12.37½c., delivered, in moderate quantities. The market is set by comparatively few sales and by those interests that are willing to dispose of their output at the low prices now prevailing. Today's quotation for copper is the lowest since 1914. Export demand is still weak, and little interest is manifested in futures.

Monthly Average Prices for February:

Copper:	
New York Electrolytic	12.556
London Standard	70.925
London Electrolytic	75.925
Lead:	
New York	4.373
St. Louis	4.228
London	20.650
Silver:	
New York, foreign	59.233
New York, domestic	99.500
London	34.745
Sterling Exchange	385.932
Zinc:	
St. Louis	4.928
London	24.850
Tin:	
99 per cent	28.534
Straits	32.142
London	166.250
Antimony	5.250
Quicksilver	49.545
Platinum	70.227

Lead

The American Smelting & Refining Co. reduced its official price of lead, New York and St. Louis, from 4.40c. to 4.20c. on Thursday, Feb. 24, and to 4c. on Friday, Feb. 25, at which price it remains. Business was fair at the low prices, several hundred tons being purchased at 3.75c. The decline from 4c. to 3.75c. was accompanied by a large number of inquiries from dealers, brokers, and manufacturers, the latter particularly among the paint, electrical, and automobile trades. Some producers refused to sell their lead at the 3.75c. level, preferring, instead, to purchase the metal. At 3.75c. New York, lead is below production costs for practically every producer in the United States. Incidentally, this price is the lowest since January, 1915.

Zinc

The zinc market has exhibited a further decline, despite lowered production and the attitude of the producers in meeting the situation. Sales for the week by the largest producers in the country have been disappointingly small. The market for ordinary brands is 4.75c., and 7.25c. for high-grade zinc. The little metal that has been changing hands has been mostly imported material.

Tin

The Malay government on Friday removed the "peg" on tin, and has withdrawn as a buyer of the Straits product. The market there is now open and spot tin during the last week has shown a decline of £13 in London. The attempt of the Straits government to artificially support the market has thus apparently ended in failure. The stock accumulated in the East will be withheld from sale for an unspecified period.

Straits tin in the domestic market has declined to below 30c., the lowest price since the latter part of 1914, and the market is quiet.

Straits tin for future delivery: Feb. 24th, 33@33.25c.; 25th, 32@32.50c.; 26th, 31.75@32c.; 28th, 31@31.25c.; March 1st, 31@31.25c.; 2d, 30@30.25c.

Arrivals of tin in long tons: Feb. 21st, Liverpool, 35; 22d, China, 10; 24th, Straits, 100; China, 25; Argentina, 75; 25th, London, 350; Straits, 150; 28th, Liverpool, 75. Total arrivals, 2,500 tons at Atlantic ports in February; 85 tons at Pacific ports.

Silver

The silver market declined the last week to 31⅜d. in London on the 25th, and then reacted to 33d. on the 28th; but has declined again on China selling, and closes weak at 31½d. The Eastern exchanges are all at very low rates, with stocks of silver large in both China and India, and the basic economic conditions all indicate lower prices for silver. On the other hand, the production of silver is being seriously affected by the fall in price, and there is likely to be a decided reduction in the output of mines producing silver outside the United States.

Mexican Dollars — Feb. 24th, 41½; 25th, 41⅜; 26th, 42⅛; 28th, 42⅞; March 1st, 42½; 2d, 41⅜.

Gold

Gold in London: Feb. 24th, 105s. 11d.; 25th, 106s. 4d.; 28th, 106s. 1d.; March 1st, 105s. 10d.; 2d, 105s. 8d.

Foreign Exchange

Legitimate trade demands are light, and speculative interests are holding aloof.

On Tuesday, March 1, demand francs were 7.19c.; lire, 3.65c.; and marks, 1.62c. New York funds in Montreal, 14 1/16 per cent premium.

Other Metals

Aluminum—List prices of 28@28.5c. are nominal. Outside market, 24@25c. per lb. Market quiet.

Antimony — Chinese and Japanese brands, 5¼c.; market quiet. W.C.C. brand, 6¼c. per lb. Cookson's "C" grade, spot, 9⅜c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony (200 mesh), 6½@7c. per lb. Demand light, with heavy supplies available.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$1.45 per lb., 500-lb. lots. London price reduced Feb. 12 from 12s. 6d. to 7s. 6d. accompanied by a decline here.

Cadmium—Nominal, $1.40 per lb., in 1,000-lb. lots.

Cobalt—Metal, $4.50 per lb.; black oxide, $3@$3.10 per lb. in bbls.; sulphate, $1.35 per lb. in bbls.

Iridium—Nominal, $300 per oz. Some dealers feel iridium is in a strong position.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small tonnages, spot, 38@40c.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$65 per oz.

Platinum—$70 per oz. Steady.

Quicksilver—Nominally, $47@$48 per 75-lb. flask. San Francisco wires $47. Market dull.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 50@55c. per long ton unit, f.o.b. Atlantic ports.

Manganese Ore—40c. per unit, seaport; chemical ore (MnO_2) $60 per gross ton, lump; $65@$70 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 40c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO_3 and over, per unit of WO_3, $3@$3.25, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 3c. per lb.

[1]**Zirkite**—According to conditions, $70 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 26—Zinc blende, per ton, high, $25.10; basis 60 per cent zinc, premium, no sales; Prime Western, $22.50@$20; fines and slimes, $17.50; average settling price, all grades of zinc, $24.84.

Lead, high, $46.30; basis 80 per cent lead, $40@$32; average settling price, all grades of lead, $40.65 per ton.

Shipments for the week: Blende, 5,524; lead, 905 tons. Value, all ores the week, $175,090. Shipments for two months: Blende, 47,699; lead, 7,968 tons. Value, all ores two months, $1,765,720. Compared with last year, the shipment is a decrease of 53,203 tons zinc and 7,059 tons lead—about one-half.

Nine purchasing agents were shipping this week from advance purchases. Only two agencies purchased ore last week, and there was only light buying this week. All but one were offering $20 per ton, Prime Western, with sellers of 2,400 tons accepting this price. Lead declined $8 per ton, closing the week with offerings of $32 basis.

One zinc buyer says prices are not pre-war but pre-historic. Not since 1897 have they averaged so low. That year the average price was $22.28 per ton. A weekly average of 3,403 tons was sold. Lead sold in 1896 at an average of $32.30 per ton.

Platteville, Wis., Feb. 26—No market for zinc or lead. Shipments for the week: Blende, 675 tons. Shipments for the year: Blende, 6,471; lead, 510 tons. Shipped during the week to separating plants, 579 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,000@ $3,000; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $35; ground (off color), $25@$30 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $8@ $10; washed, $10@$12; powdered, $15@ $20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $15@ $20, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30;

imported lump, $15@$25, f.o.b. American ports; powdered, $35@$45, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Heathden, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines. Demand very slack, with ample stocks on hand.

Fuller's Earth—$16 per ton, carload lots, f.o.b. mines.

Graphite—Ceylon lump, first quality, 8@9c. per lb.; chip, 7c.; dust, 5½c. No. 1 flake, 7½c.; high-grade amorphous crude, 3c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica, slightly stained, per lb.: No. 6, 35c.; No. 5, $1.20; No. 4, $2.50@$3; No. 3, $3.50@$4; No. 2, $4.50@$6; No. 1, $5.50@$6.50. Clear block: No. 6, 50c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $6.50@$8.50; extra large, $25; ground, wallpaper grade, $90@$160 per ton (depending upon quantity); all f.o.b. New York.

[1]**Monazite**—Minimum of 6 per cent thorium oxide, quoted $30 per unit, duty paid.

Phosphate Rock—Domestic demand weak; movements of stocks into consuming channels reported slow. Per long ton, Florida ports: 77 per cent tricalcium phosphate, $12; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 16c., c.i.f. Atlantic seaport; furnace size, 16½c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12 @ 14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc—Paper making, $11@$20 per ton; roofing grades, $8.50@$13; rubber grades, $11@$18; all f.o.b. Vermont. California talc, $18@$45, talcum powder grade. Southern talc, powdered, carload lots, $10@$14 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $40 @$50; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 9@10c. per lb. in carload lots. Usual spring demand is not being felt for insecticides. Supplies are plentiful and market is dull.

Sodium Nitrate—$3 per cwt. ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $20 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract; $32 per ton, New York.

Potassium Sulphate—Domestic, $220 @$230 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrotitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $100, f.o.b. furnaces; resale, $90, delivered; English, $100, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $40@$45, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $55@$60; 50 per cent, $80@$85; 75 per cent, $145@$150.

Ferrotungsten—Domestic, 70 to 80 per cent W, 55@60c. per lb. of contained tungsten, f.o.b. works. Foreign, 60c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $5 per lb. of V contained, plus 75c.@$2 differentials and according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York list price, 21½c. per lb.; wire, 15¾.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 8½c.; cut lead sheets, 8¾c. in quantity, mill lots.

Nickel Silver—33½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 19¾c.; sheathing, 19¾c.; rods, ⅜ to 3 in., 16¾c.

Zinc Sheets—$11 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $45@$50 per net ton, and $55 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—Straights, $80 per net ton, shipping point; arches, keys, wedges, $85; splits, soaps, $100.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick—9-in. straights, $90 @$100 per net ton; 9-in. arches, wedges and keys, $105; soaps and splits, $120.

Silica Brick—9-in., per 1,000: $45@$55 in carload lots, f.o.b. shipping points.

The Iron Trade

Pittsburgh, March 1, 1921

Few declines in finished-steel products have occurred in the last week, not so much because mills are not willing to make additional cuts as because there is little incentive by way of attractive orders. Plates have been quoted at 2.10c., against 2.25c. a week ago, and the Industrial Board price of 2.65c. Black sheets can be done readily at 4.10c., against 4.15c. a week ago, and the Industrial Board price of 4.35c., and galvanized are available at 1.15c. above black, instead of 1.20c. Structural shapes have shown no activity. Bars are still quotable at 2c. It is believed that 1.90c. or possibly even 1.85c. could be done on a sufficiently attractive order.

The extreme stagnation of the last few weeks is likely to be followed by a moderate amount of buying this month and next, on account of the season, but no widespread buying movement is expected for any time this year.

Pig Iron—Foundry iron is quotable $1 lower, at $27, Valley, bessemer remaining at $27 and basic at $25. Some stocks of basic in the hands of steel works could probably be bought for less than $25.

Semi-finished Steel.—A large independent producer has quoted sheet bars at $42, against the Corporation price of $47, but did not interest the consumer. Billets may be quoted by inference at $40.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls., hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville — Furnace, $5@$5.50; foundry, $6@$6.50.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1920	1921	1920	1921	1920	1921
January	132.827	65.950	79.846	39.985	367.082	372.650
February	131.295	59.233	85.005	34.745	337.466	385.932
March	125.551	.....	74.194	.....	370.870	.....
April	119.779	.....	68.848	.....	392.438	.....
May	102.585	.....	60.010	.....	383.360	.....
June	90.957	.....	51.096	.....	393.663	.....
July	91.971	.....	53.736	.....	385.538	.....
August	96.168	.....	59.875	.....	360.404	.....
September	93.675	.....	59.476	.....	350.370	.....
October	83.480	.....	54.197	.....	346.460	.....
November	77.734	.....	50.952	.....	342.333	.....
December	64.774	.....	41.845	.....	348.101	.....
Year	100.900	.....	61 590	.....	364.840	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1920	1921	1920	1921	1920	1921
January	18.918	12.597	118.095	70.964	123.238	79.119
February	18.569	12.556	120.188	70.925	126.950	75.925
March	18.331	.....	109.533	.....	118.348	.....
April	18.660	.....	103.025	.....	111.500	.....
May	18.484	.....	96.750	.....	109.200	.....
June	18.065	.....	87.864	.....	101.909	.....
July	18.576	.....	90.148	.....	106.455	.....
August	18.346	.....	93.935	.....	111.143	.....
September	18.144	.....	96.381	.....	111.905	.....
October	15.934	.....	93.327	.....	104.905	.....
November	14.257	.....	84.807	.....	94.614	.....
December	13.188	.....	75.702	.....	85.905	.....
Year	17.456	.....	97.480	.....	108.839	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London	
	1920	1921	1920	1921	1920	1921
January	8.561	4.821	8.300	4.747	47.095	23.387
February	8.814	4.373	8.601	4.228	50.256	20.650
March	9.145	.....	8.894	.....	46.054	.....
April	8.902	.....	8.618	.....	39.225	.....
May	8.576	.....	8.352	.....	38.488	.....
June	8.323	.....	8.169	.....	34.330	.....
July	8.338	.....	8.283	.....	34.960	.....
August	8.687	.....	8.725	.....	36.304	.....
September	8.177	.....	8.160	.....	35.452	.....
October	7.070	.....	7.018	.....	35 238	.....
November	6.159	.....	6.127	.....	32.489	.....
December	4.727	.....	4.717	.....	24.089	.....
Year	7.957	.....	7.830	.....	37.832	.....

New York and St. Louis quotations, cents per lb. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1920	1921	1920	1921	1920	1921
January	61.596	36 000	.....	36.000	376.512	190.464
February	58.466	28.534	59.932	32.142	395.750	166.250
March	61.037	.....	61.926	.....	369.489	.....
April	61.120	.....	62.115	.....	345.450	.....
May	53.230	.....	55.100	.....	294.813	.....
June	46.125	.....	48.327	.....	250.614	.....
July	45.798	.....	49.154	.....	261.886	.....
August	43.856	.....	47.620	.....	274.048	.....
September	41.940	.....	44.465	.....	270.120	.....
October	39.310	.....	40.555	.....	258.190	.....
November	35.667	.....	36.854	.....	241.080	.....
December	31.135	.....	34.058	.....	212.440	.....
Year	48.273	.....	49.101	.....	295.866	.....

New York quotations, cents per lb. London, pounds sterling per long ton.

Zinc

	St. Louis		London	
	1920	1921	1920	1921
January	9.133	5 413	58.643	25.262
February	8.708	4.928	61.338	24.850
March	8.531	.....	53.467	.....
April	8.184	.....	47.388	.....
May	7.588	.....	45.088	.....
June	7.465	.....	41.193	.....
July	7.720	.....	41.886	.....
August	7.835	.....	41.220	.....
September	7.661	.....	39.690	.....
October	7.150	.....	39.756	.....
November	6.247	.....	35.028	.....
December	5.824	.....	27.762	.....
Year	7.671	.....	44.372	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1920	1921	1920	1921	1920	1921
January	10.577	5.258	90.192	48.440	154.23	73.400
February	11.588	5.250	84.432	49.545	151.59	70.227
March	11.056	.....	92.611	.....	138.56	.....
April	10.500	.....	102.192	.....	127.04	.....
May	9.655	.....	89.560	.....	97.50	.....
June	8.289	.....	90.154	.....	85.19	.....
July	7.500	.....	90.333	.....	83.94	.....
August	7.177	.....	83.806	.....	111.44	.....
September	7.113	.....	75.000	.....	115.20	.....
October	6.723	.....	67.200	.....	101.70	.....
November	6.109	.....	58.417	.....	84.75	.....
December	5.534	.....	49.577	.....	79.62	.....
Year	8.485	.....	81.123	.....	110.90	.....

(a) Antimony quotations in cents per lb. for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1920	1921	1920	1921	1920	1921
January	$40.47	33.96	$39.88	31.96	$39.86	33 88
February	42.95	28.96	42.61	26.96	43.40	30.12
March	43.40	.....	42.90	.....	43.40	.....
April	43.72	.....	44.22	.....	43.90	.....
May	44.00	.....	44.88	.....	45.36	.....
June	44.89	.....	45.41	.....	46.40	.....
July	47.21	.....	47.42	.....	46.56	.....
August	48.90	.....	49.88	.....	49.35	.....
September	50.46	.....	50.46	.....	51.96	.....
October	49.21	.....	44.38	.....	48.58	.....
November	41.26	.....	39.20	.....	42.61	.....
December	36.96	.....	34.90	.....	37.73	.....
Year	44.45	.....	43.85	.....	44.93	.....

In dollars per long ton.

Monthly Crude Copper Production

	1920			1921
	October(a)	November	December	January
Alaska shipments	4,984,219	12,802,696	6,631,700	5,241,634
Arizona Copper	2,800,000	2,800,000	2,650,000	2,300,000
Calumet & Arizona	3,802,000	3,486,000	3,300,000	2,438,000
Cons. Ariz. Smelting	865,000	750,000	476,000	.....
Inspiration	7,000,000	5,350,000	5,000,000	5,000,000
Magma	750,814	671,752	600,000	600,000
Miami	4,582,293	4,505,232	4,373,123	4,439,000
New Cornelia	3,450,000	2,670,000	2,688,456	2,170,000
Old Dominion	2,912,000	2,563,000	2,655,000	2,822,000
Phelps Dodge	5,309,000	5,492,000	5,850,000	6,339,000
Shattuck Arizona	206,772	6,063	.....	.....
Ray	3,990,800	3,975,000	2,975,000	2,983,000
United Verde	5,858,000	4,030,000	3,260 000	3,500,000
United Verde Extension	3,864,756	2,642,812	3,204,258	3,219,912
Calumet & Hecla	7,945,502	7,326,763	7,507,712	7,234,300
Other Lake Superior	6,000,000	6,000,000	6,000,000	6,000,000
Anaconda	11,000,000	11,100,000	10,500,000	9,700,000
East Butte	1,626,980	1,658,860	1,538,760	1,500,000
Nevada Cons	3,850,000	3,950,000	3,000,000	3,000,000
Chino	3,933,435	4,000,000	2,999,000	2,999,751
Utah Copper	8,000,000	9,120,000	7,500,000	7,500,000
Eastern Smelters	1,600,000	1,600,000	1,600,000	1,500,000
Others, estimated	10,900,000	10,200,000	11,400,000	10,000,000
Total United States	105,231,571	106 700 178	95,709,009	90,586,597
Imports: Ore and concentrates, etc	9,626,502	7,143,610	6,331,559	.....
Imports in blister, etc	24,559,763	31,148,088	34,619,919	.....
Grand total	139 417 836	145,291,876	136,660,487	.....
British Columbia:				
Granby Cons	2,293,500	2,465,585	2,665,018	2,530 038
Mexico				
Boleo	617,200	771,680	1,014,160	969,920
Cananea	3,500,000	3,500,000	3,700,000	2 530,038
Phelps Dodge Mexican properties	1,817,000	2,666,000	2,468,000	2,362,000
Other foreign:				
Cerro de Pasco	4,698,000	3,612,000	4,258,000	4,086,000
Chile	9,420,000	8,859,984	.....	.....
Katanga	2,697,696	3,174,624	.....	.....
Backus & Johnston	1,740,000	1,548,000	1,604,000	1,760,000

Comparative Annual Copper Production

	1919	1920	1921
January	135,733,511	121,903,744	90,586 597
February	111,649,512	117,450,000	.....
March	102,040,460	120,309,316	.....
April	98,808,998	116,078,871	.....
May	92,652,975	114,964,207	.....
June	95,856,570	116,107,856	.....
July	100,369,247	109,729,510	.....
August	107,994,040	116,460,654	.....
September	108,703,075	(a) 104,919,262	.....
October	115,143,143	(a) 105,231,571	.....
November	117,289,735	106,700 178	.....
December	102,997,633	95,709,009	.....

(a) Revised

COMPANY REPORTS

St. Joseph Lead Co. Reports Large Earnings

Lead; Missouri

The annual report of the St. Joseph Lead Co. states that in the year 1920 dividends to the amount of $2,889,436 in cash were paid to stockholders and a stock dividend of 140,946.6 shares was distributed ($1,409,466).

As the earnings for the fiscal year, after allowances for depreciation, depletion, and reserve for Federal taxes were $2.563,690 after an addition of $78,823 due to the separation of the accounts of the St. Joseph Lead Co. and the Doe Run Lead Co., the company's surplus on Dec. 31, 1920, was $1,656,390 less than on Dec. 31, 1919.

The mines produced 2,133,327 tons of ore, yielding 119,429 tons of lead concentrates and producing 78,497 tons of pig lead.

During the year the company purchased and now holds in its treasury, or in the sinking fund, $230,000 additional bonds of the Mississippi River & Bonne Terre Ry. Holdings of Government securities on Dec. 31, 1920, were Third 4¼ per cent U. S. Liberty Loan. $1,500,000; U. S. certificates of indebtedness 5¾ per cent, $1,450,000.

Federal income and excess profits taxes amounting to $105,700 were paid in 1920 on account of 1919 income.

Income account as taken from the consolidated general balance sheet, Dec. 31, 1920, follows:

	1920	1919
Net income after providing for depreciation of plant	$4,813,512	$2,295,256
Depletion	1,202,086	1,116,816
Federal taxes	600,000	117,844
Balance	3,011,426	1,060,596
Cash dividends	2,889,436	1,550,478
Surplus	$121,990	$489,882 (a)

(a) Deficit.

The surplus account stood at $11,098,952 on Dec. 31, 1920, compared with $12,755,342 Dec. 31, 1919.

The International Nickel Co.

The International Nickel Co. has issued the following statement covering its condition on Dec. 31, 1920:

ASSETS

Property	$48,093,797.90
Investments	1,085,971.43
Inventories	11,764,482.86
Accounts and bills receivable	1,208,213.96
Loans on call	2,015,000.00
Cash	1,757,997.14
Total	$65,925,463.29

LIABILITIES

Preferred stock	$8,912,600.00
Common stock	41,834,600.00
Accounts payable and tax reserves	1,786,674.06
Preferred dividend No. 61 payable Feb. 1, 1921	133,689.00
Accident and insurance funds	396,860.50
Exchange reserve	250,000.00
Surplus April 1, 1920	10,391,233.38
Profit and loss (balance as per statement)	2,219,806.35
Total	$65,925,463.29

CONSOLIDATED GENERAL PROFIT AND LOSS STATEMENT

Nine Months Ending Dec. 31, 1920

Earnings		$4,415,774.20
Other income		920,164.81
Total income		$5,335,939.01
Administration and general expense	$495,217.76	
Reserved for U. S. and foreign taxes (estimated)	534,840.63	1,030,058.39
Net income		$4,305,880.62
Depreciation and mineral exhaustion		1,685,007.27
Profits		$2,620,873.35

DIVIDENDS

Preferred No. 59—Paid Aug. 2, 1920	$133,689.00	
Preferred No. 60—Paid Nov. 1, 1920	133,689.00	
Preferred No. 61—Payable Feb. 1, 1921	133,689.00	401,067.00
Balance		$2,219,806.35

Davis-Daly Copper Co.

A report of the Davis-Daly Copper Co. for the three months ended Dec. 31, 1920, states that, unlike many copper mining companies, production has not been curtailed.

Receipts and disbursements follow:

RECEIPTS

	Ore Returns	Miscellaneous Revenues
October	$50,282.62	$3,115.07
November	75,099.82	2,480.15
December	54,772.13	8,810.52
	$180,154.57	$14,405.74

Total receipts, $194,560.31.

DISBURSEMENTS

	Development	Mining Cost	Equipment	Butte Gen. Exp.	Boston Expense
October	$16,742.65	$61,014.60	$4,375.34	$15,545.07	$4,764.68
November	10,077.30	49,800.07	3,325.50	11,303.65	3,888.89
December	13,158.98	42,454.16	2,337.93	15,593.72	a14,504.91
	$39,978.93	$153,268.83	$10,038.77	$42,442.44	$23,158.48

Total disbursements, as above, $268,887.45. (a) Including U. S. income tax.

New Jersey Zinc Co.

The New Jersey Zinc Co. has issued the following statement of operations for the last quarter of and the year 1920:

Income (including dividends from subsidiary companies), after deductions for expenses, taxes, maintenance, repairs and renewals, betterments, depreciation and contingencies		$881,557.42
Deduct interest on first mortgage bonds		40,000.00
Net income		$841,557.42
Dividend:		
2 per cent payable Feb. 10, 1921		840,000.00
Surplus for the quarter		$1,557.42
Net income:		
First quarter		$2,628,127.47
Second quarter		2,756,576.98
Third quarter		1,711,873.69
Fourth quarter		841,557.42
		$7,938,135.56
Less:		
Dividends declared	$5,600,000.00	
Accrued interest on stock subscriptions	13,092.18	
Reserve for adjustments of inventories and Federal taxes	341,179.92	5,954,272.10
Surplus for the year		$1,983,863.46

Mining Dividends for February, 1921

The following is a partial list of dividends paid by American mining and metallurgical companies during February, 1921:

Companies in the United States	Situation	Per Share	Totals
Chief Consolidated, l. s.	Utah	$0.05Q	$44,211
Granite Gold, g.	Col.	.03K	52,500
Internat. Nickel	U. S. and Canada	1.50Q	133,689
Miami Copper*	Ariz.	.50Q	373,557
New Jersey Zinc	N. J.	2.00Q	840,000
United Verde Extension	Ariz.	.50Q	525,000
Companies in Canada and Mexico			
Amparo Mining, g. s.	Mex.	0.03Q	$60,000
Hollinger Consol. Gold	Canada	.05M	246,000

Q. Quarterly; K, Irregular; M, Monthly.

*Miami Copper Co.'s dividend No. 34 was paid on Feb. 15, 1921, and not in January, as previously announced.

The feature of February's dividend record among mining companies was the omission of the $1 quarterly dividend paid by the Anaconda Copper Mining Co. since May, 1919, when it was reduced from $2 to $1. Other companies omitting dividends due at this time were Greene-Cananea Copper, American Zinc, Lead & Smelting, Ltd., and Mohawk Mining. The New Jersey Zinc, the Chief Consolidated, and the Amparo Mining companies reduced the amount of their disbursements; but Granite Gold Mining pays for the first time since March, 1918.

The Rand Mines, Ltd., paid $2 per share on "American" shares, Feb. 25; and on Dec. 31, 1920, the North Star Mines disbursed $75,000 to its 250,000 shares outstanding. Frontino & Bolivia Gold paid a semi-annual dividend of 1s., amounting to £7,000, on Jan. 13.

MINING STOCKS

Week Ended February 26, 1921

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	....	....	*60		
Ahmeek	Boston	50	48	48½	Sept. '20, Q	$0.50
Alaska-Br. Col.	N. Y. Curb	⅛	⅛	⅛		
Alloues	Boston	22	22	22	Mar. '19	1.00
Anaconda	New York	38½	38	38½	Nov. '20, Q	1.00
Arcadian Consol.	Boston	2⅛	2⅛	2⅛		
Ariz. Com'l	Boston	8½	8½	8½	Oct. '18,	.50
Big Ledge	N. Y. Curb	⅛	1/16	⅛		
Bingham Mines	Boston	....	....	8½	Sept. '19, Q	.25
Calumet & Arisona	Boston	50	47	47½	Dec. '20, Q	1.00
Calumet & Hecla	Boston	252	235½	238	June '20, Q	5.00
Canada Copper	N. Y. Curb	....	....	*13		
Centennial	Boston	9½	9½	9½	Dec. '18, SA	1.00
Cerro de Pasco	New York	28½	27½	27½	Dec. '20, Q	1.00
Chile Copper	New York	11⅛	11⅛	11⅛		
Chino	New York	22⅛	21⅛	21⅛	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*35½	*33½	*34		
Con. Arisona	N. Y. Curb	....	....	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	....	....	2⅛		
Copper Range	Boston	35½	34	34½	Sept. '20, Q	.50
Crystal Copper (new)	Boston Curb	*38	*34	*34		
Davis-Daly	Boston	6½	6½	6½	Mar. '20, Q	.25
East Butte	Boston	9½	9	9	Dec. '19, A	.50
First National	Boston Curb	*95	*85	*90	Feb. '19, SA	.15
Franklin	Boston	....	....	2⅛		
Gadsden Copper	N. Y. Curb	....	....	*25		
Granby Consol.	New York	22	22	22	May '19, Q	1.25
Greene-Cananea	New York	22⅛	22	22⅛	Nov. '20, Q	.50
Hancock	Boston	2⅛	2⅛	2⅛		
Howe Sound	N. Y. Curb	....	....	3	Jan. '21, Q	.05
Inspiration Consol.	New York	35	34½	35	Oct. '20, Q	1.00
Iron Cap	Boston Curb	7½	6½	6½	Sept. '20, K	.25
Isle Royale	Boston	20	19½	20	Sept. '19, SA	.50
Kennecott	New York	18½	17⅞	18⅛	Dec. '20, Q	.50
Keweenaw	Boston	1⅛	1⅛	1⅛		
Lake Copper	Boston	3⅛	3	3		
La Salle	Boston	1⅛	1⅛	1⅛		
Magma Chief	N. Y. Curb	....	....	*21		
Magma Copper	N. Y. Curb	24⅛	23½	23½	Jan. '19, Q	.50
Majestic	Boston Curb	*15	*11	*15		
Mason Valley	Boston	1⅛	1⅛	1⅛		
Mass Consolidated	Boston	2⅛	2⅛	2⅛	Nov. '17, Q	1.00
Mayflower-Old Col.	Boston	4	3⅞	4		
Miami Copper	New York	18⅛	18⅛	18⅛	Feb. '21, Q	.50
Michigan	Boston	2⅛	2⅛	2⅛		
Mohawk	Boston	48⅛	47	48	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb	5⅛	5⅛	5⅛		
Nevada Consol.	New York	11⅛	10⅞	11⅛	Sept. '20, Q	.25
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	15⅛	14	14⅛	Aug. '20, K	.25
Nixon Nevada	N. Y. Curb	....	....	*5		
North Butte	Boston	12⅛	11⅛	11⅛	Oct. '18, Q	.25
North Lake	Boston	....	....	*45		
Ohio Copper	N. Y. Curb	....	....	1/16		
Old Dominion	Boston	20⅛	19⅛	19⅛	Dec. '18, Q	1.00
Osceola	Boston	27⅛	27	27	June '20, Q	.50
Phelps Dodge	Open Mar.	....	†165	....	Jan. '21, Q	2.50
Quincy	Boston	39	39	39	Mar. '20, Q	1.00
Ray Consolidated	New York	13⅛	12⅛	13⅛	Dec. '20, Q	.25
Ray Hercules	Boston Curb	*63	*63	*63		
St. Mary's Min. Ld.	Boston	34	32⅛	32⅛	June '20, K	2.00
Seneca Copper	Boston	17⅛	16⅛	16⅛		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	.25
Shattuck Arisona	New York	6½	6½	6½	June '20, Q	.25
South Lake	Boston	....	....	1		
Superior Copper	Boston	4⅛	4	4	Apr. '17,	1.00
Superior & Boston	Boston	2⅛	2	2⅛		
Tenn. C. & C. ctfs.	New York	8⅛	8⅛	8⅛	May '18, I	1.00
Toulumne	Boston	*58	*56	*56	May '13,	.10
United Verde Ex.	Boston Curb	29	27	28	Feb. '21, Q	.50
Utah Consol.	Boston	4	4	4	Sept. '18,	.25
Utah Copper	New York	52	48⅛	50	Dec. '20, Q	1.50
Utah M. & T.	Boston	2	1⅞	1⅞	Dec. '17,	.30
Victoria	Boston	1⅛	1⅛	1⅛		
Winona	Boston	*75	*60	*75		
Wolverine	Boston	14	13½	13½		
NICKEL-COPPER						
Internat. Nickel	New York	15⅛	15⅛	15⅛	Mar. '19,	.50
Internat. Nickel, pf.	New York	80	80	80	Feb. '21, Q	1.50
LEAD						
National Lead	New York	....	....	71⅛	Dec. '20, Q	1.50
National Lead, pfd.	New York	103⅛	103⅛	103⅛	Dec. '20, Q	1.75
St. Joseph Lead	New York	12	11⅛	12	Dec. '20, QX	.50
Stewart Mining	Boston Curb	....	....	*6	Dec. '15,	.05
ZINC						
Am. Z. L. & S.	New York	9	9	9	May '20,	1.00
Am. Z. L. & S, pfd.	New York	28⅛	28	28	Nov. '20, Q	1.50
Butte C. & Z.	New York	5⅛	4⅞	4⅞	June '18,	.50
Butte & Superior	New York	13	12⅛	12⅛	Sept. '20,	1.25
Callahan Zn-Ld.	New York	6	5⅛	6	Dec. '20, Q	.50
New Jersey Zn.	N. Y. Curb	142	141	142	Feb. '21, Q	2.00
Success	N. Y. Curb	*3	*2	*2⅛	July '16,	.03
Yellow Pine	Los Angeles	....	....	*59	Sept. '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	New York	1⅛	1	1⅛		
Alaska Juneau	New York	1⅛	1⅛	1⅛		
Carson Hill	N. Y. Curb.	....	....	22⅛		
Cresson Consol. G.	N. Y. Curb	....	....	1⅛	June '20, Q	$0.10
Dome Extension	Toronto	....	....	*45		
Dome Mines	New York	16⅛	14⅛	15⅛	Jan. '21, Q	.25
Golden Cycle	Colo. Sprgs.	‡....	....	*73	Dec. '20, Q	.02
Goldfield Consol.	N. Y. Curb	*9	*7⅛	*8⅛	Dec. '19,	.05
Hollinger Consol.	Toronto	6.61	6.54	6.60	Feb. '21, M	.05
Homestake Mining	New York	....	....	50	Sept. '19,	.50
Kirkland Lake	Toronto	*51	*50	*50		
Lake Shore	Toronto	1.17	1.17	1.17	Jan. '21, K	.02
McIntyre-Porcupine	Toronto	1.98	1.98	1.98	Jan. '21, K	.05
Porcupine Crown	Toronto	*23	*22⅛	*23	July '17,	.03
Portland	Colo. Sprgs.	‡....	....	*60	Oct. '20, Q	.01
Reorgan. Booth	N. Y. Curb	*6	*4⅛	*5⅛	May '19,	.05
Silver Pick	N. Y. Curb	*8	*5⅛	*5⅛		
Teck Hughes	Toronto	*10⅛	*10⅛	*10⅛		
Tom Reed	Los Angeles	1.28	1.25	1.26	Dec. '19,	.02
United Eastern	N. Y. Curb	2 1/16	2⅛	2 1/16	Jan. '21, Q	.15
Vindicator Consol.	Colo. Sprgs.	†....	....	*18	Jan. '20 Q	.01
West Dome Consol.	Toronto	*9⅛	*8	*8		
White Caps Mining	N. Y. Curb	*8	*7	*7⅛		
Yukon Gold	N. Y. Curb	*100	*100	*100	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*21	*19	*20	Apr. '20, M	.03
Batopilas Mining	New York	⅛	⅛	⅛	Dec. '07, I	.12½
Beaver Consol.	Toronto	*39	*38	*38	May '20, K	.03
Coniagas	Toronto	....	....	2.05	Nov. '20, Q	.12½
Crown Reserve	Toronto	....	....	*17	Jan. '17,	.05
Kerr Lake	Boston	2⅛	2⅛	2⅛	Jan. '21, Q	.12½
La Rose	Toronto	*27½	*25½	*25½	Apr. '18,	.02
McKinley-Dar.-Sav.	Toronto	*30	*30	*30	Oct. '20, Q	.03
Mining Corp. Can.	Toronto	1.11	1.11	1.11	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	8⅛	7⅛	8	Jan. '21, QX	.50
Ontario Silver	New York	....	....	4⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	1	1/16	1	Jan. '12,	.10
Peterson Lake	Toronto	....	....	*7⅛	Jan. '17,	.01½
Temiskaming	Toronto	....	....	*27	Jan. '20, K	.04
Trethewey	Toronto	*17	*17	*17	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1	*2		
Barnes-King	Butte	‡....	....	1.11	Aug. '20, Q	.05
Boston & Montana	Boston	....	....	*63		
Cashboy	N. Y. Curb	*7	*6	*7		
El Salvador	N. Y. Curb	1/16	1/16	1/16		
Jim Butler	N. Y. Curb	*17	*14	*15	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*10	*8	*8⅛	June '16,	.05
Louisiana Con.	N. Y. Curb			⅛		
MacNamara M.& M.	N. Y. Curb	*17	*15	*16	May '10,	.02½
N. Y. Hond. Rosar.	Open Mar.	†10⅛	†9	....	Jan. '21, Q	.30
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1 1/16	Jan. '21, Q	.05
Tonopah-Divide	N. Y. Curb	1⅛	1 1/16	1 1/16		
Tonopah-Extension	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '21, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1 1/16	Oct. '20, SA	.05
West End Consol.	N. Y. Curb	1 1/16	1	1 1/16	Dec. '19, SA	.05
SILVER-LEAD						
Caledonia	N.Y. Curb	*11	*9½	*11	Jan. '21, M	.01
Cardiff M. & M.	Salt Lake	1.15	1.15	1.15	Dec. '20,	.15
Chief Consolidated	Boston Curb	2⅛	2⅛	2⅛	Feb. '21, Q	.05
Consol. M. & S.	Montreal	19½	18	18	Oct. '20, Q	.62½
Daly Mining	Salt Lake	....	....	2.50	July '20, Q	.10
Daly-West	Boston	4	4	4	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2⅛	Dec. '20, K	.25
Electric Point	Spokane	*5	*5	*5	May '20, SA	.03
Federal M. & S.	New York	....	....	8	Jan. '09,	1.50
Federal M. & S., pfd.	New York	26⅛	25⅛	26⅛	Dec. '20, Q	1.75
Florence Silver	Spokane	*16	*16	*16	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37⅛	June '20, K	.03
Hecla Mining	N. Y. Curb	4⅛	4⅛	4⅛	Dec. '20, QX	.15
Iron Blossom	N. Y. Curb	1/16	1/16	1/16	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	....	....	3.00	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*10	*7	*8		
Prince Consol.	N. Y. Curb	⅛	⅛	1/16	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*7⅛	*7	*7	Feb. '19,	.01
Rex Consol.	N. Y. Curb	*7⅛	*6	*6		
South Hecla	Salt Lake	....	....	*66	Sept. '19, K	.15
Standard Silver-Ld.	N. Y. Curb	1/16	1/16	1/16	Oct. '17,	.05
Tamarack-Custer	Spokane	2.00	1.95	2.00	Jan. '21, K	.04
Tintic Standard	Salt Lake	3.35	3.25	3.30	June '20, Q	.10
Utah Apex	Boston	2⅛	2⅛	2⅛	Nov. '20, K	.25
Wilbert Mining	N. Y. Curb	*3	*2	*3	Nov. '17,	.01
QUICKSILVER						
New Idria	Boston	....	....	*95	Jan. '19,	.25
VANADIUM						
Vanadium Corp.	New York	37⅛	32	35⅛	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	....	....	80⅛	Jan. '21, QX	3.50
Asbestos Corp., pfd.	Montreal	90	90	90	Jan. '21, QX	3.75
MINING, SMELTING AND REFINING						
Amer. Sm. & Ref.	New York	42⅛	42⅛	41⅛	Dec. '20, Q	1.00
Amer. Sm. & Ref. pf.	New York	82⅛	82⅛	82⅛	Dec. '20, Q	1.75
Am. Sm. pf. A	New York	65⅛	65⅛	65⅛	Jan. '21, Q	1.50
U. S. Sm. R. & M.	New York	33⅛	32⅛	32⅛	Jan. '21, Q	.50
U.S.Sm.R.& M. pf.	Boston	43⅛	42⅛	43	Jan. '21, Q	.87½

* Cents per share. † Bid or asked. ‡ Quotations missing. Q, Quarterly. SA, Semi-annually. BM, Bi-monthly. K, Irregular. I, Initial. X, Includes extra.

INDUSTRIAL NOTES

New Auto-Transformer Starter Easily Tended by One Man

For the starting of standard squirrel-cage motors operating mine pumps, fans, conveyors, tipple machinery, crushers, etc., an auto-transformer starter has been developed by the engineering department of the Cutler-Hammer Manufacturing Co., of Milwaukee, Wis. The simple steel construction—using no wood or castings whatsoever — the absence of flexible moving leads, and the ease of inspection of the contacts and adjustment of the relays, enable this device to give continuous and satisfactory service at a low upkeep cost. The starter consists of two auto-transformers, commutating mechanism, low-voltage release and duplex overload relay, all inclosed in a sheet-metal case with the operating lever outside. The case is strongly reinforced with angle iron, and has a hinged cover. The transformers and case are carried directly on the supporting brackets and may be readily mounted on the wall, switchboard, or any post or pedestal. Interlocks prevent moving the operating lever directly to the running position. If released in the first or starting position, the lever is returned to neutral by a spring. It may be locked in the neutral position to prevent unauthorized operation. The oil-immersed commutating mechanism is placed at the bottom of the case below the transformers and may be exposed for inspection by the removal of the oil pan, a simple one-man job. An ample head of oil is maintained above the contacts and a double horizontal break is provided in each line. Breaking the circuit horizontally confines the arcs between the copper contacts and prevents burning of parts not designed for that service. The stationary contacts are drop-forged pieces of copper carried on non-stubbing fingers easily adjusted and renewed. The moving contacts or segments are short copper strips, which are made reversible so as to provide double the normal amount of service.

These starters are made in various sizes for the operation of two- or three-phase induction motors rated between 5 and 100 hp., on standard commercial voltages between 110 and 2,200 and at frequencies of 60, 50, 40, 33, and 25 cycles per second.

Wullstein Gravitation Screen

Construction Produces Mobile Bed and High Efficiency

An interesting new type of stationary screen is being put on the market by the International Gravitation Screen Co. of Salt Lake City, Utah. It is of the inclined type, adjustable for slope. The screen consists of a series of overlapping "combs." Each comb consists of a steel retaining bar in which teeth of steel wire are firmly attached. The teeth are in pairs, each one being shaped like a hairpin. After being placed in the retaining bar the prongs are bent, one down and the other up.

FINE GRADE WULLSTEIN GRAVITATION SCREEN

The bending is slight. Looked at from the edge of the comb the ends of the teeth follow what appears to be a staggered path. The result of this bending is to leave an opening, which is narrowest at the point of attachment and widest at the free end of the steel prong. The ends of the prongs, being free, allow of vibration and spring. The combs are held in place by two side boards and can be readily replaced. Our illustration shows the finer-meshed pattern ready for work.

The material to be screened is fed over a flat sole piece in a thin sheet and runs down the sloping surface of the screen. It is exceedingly mobile, there being a pronounced up-and-down motion in the vertical plane as well as a side-to-side motion in a horizontal plane. The screen does not blind. This is due to the fact that the screen openings are widest at the ends of the prongs and the movement of the particle prevents any from lodging between the prongs. The capacity is large, both on account of the large effective screen area opening and because of the mobile character of the bed. A high capacity and efficiency are claimed for the screen. The principle of the screen is also being applied to the grizzly for very coarse screening, although it appears to be suitable for comparatively fine screening down to 16 or 20 mesh at least.

The Motor Truck Serves the People Cheaply and Efficiently

In discussing the motor truck as a competitor of the railroads, the *Mining Congress Journal* for October, 1920, points out that "The public highways are maintained by the people who use them, either by direct taxation or by license fees paid by the users of automobiles and trucks, and that these same highways were maintained at public expense long before railroads were dreamed of. When motor-truck freight transportation over any considerable distance is at all possible in competition with railroad transportation it is proof that the railway service is so clumsily handled as to need such competition in order that it shall be made to meet more efficiently the public requirements. There was a time when the farmer carried his grain in a sack over his shoulder miles across the country upon the best highway available to have it ground into flour. Later the ox cart, then the mule team, and later still the motor truck were the means through which a marvelous advance in civilization was accomplished. All of these have used the public highways, and the railroad as such can command business only to the extent that its service is vastly cheaper than that which can be otherwise furnished. Motor-truck transportation for short hauls and for city delivery has a distinct advantage over railroad transportation between the same points. That such competition shall interfere with railroad traffic for any great distances is a libel upon railroad management."

Newspapers and Periodicals in Japan

A list of newspapers, trade papers, and magazines in circulation in the principal cities of Japan has been compiled by the Far Eastern Division of U. S. Department of Commerce, Washington, D. C. The nature of the publication, its circulation, subscription price, rates of advertising, and other available information is given. (Request file number FE-11029.)

Chain Hoists Handle Materials in the Oil Field

Relative Advantages of Various Types Discussed by the Vice-President of the Wright Manufacturing Co.

One of the most interesting and extensive problems of the oil industry is the handling of materials in the field, and the requirements of the work have been an inspiration to the manufacturers of lifting devices in general and of chain hoists in particular.

In the economical handling of various materials that must be lifted and moved from place to place, cranes and chain hoists play an important part. There is probably no organization in the oil industry that does not employ them. The chief advantages of these machines lie in their great power and

WRIGHT CHAIN HOIST

self-locking features. Light and compact, for short lifts, they are unsurpassed by any device yet designed. They are made in sizes up to thirty tons' capacity.

For the handling of heavy materials and work involving high lifts, cranes are frequently employed, although the number in use is rather small. A common method is that of erecting beams with trolleys or runners to which chain hoists are attached, such as are shown in the accompanying photograph.

The proper selection of a chain hoist involves, according to H. F. Wright, vice-president of the Wright Manufacturing Co., Lisbon, Ohio, an understanding of principles that are frequently overlooked. There are three separate and distinct types of chain hoists on the market, the differential pulley block, the screw hoist, and the high-speed hoist. Each of these is made for a particular class of work. The differential pulley block was the first to be used, and as it costs only one third as much as its modern rival, is still found occasionally where considerable lifting is done.

In addition to price, two other factors must be considered when a new hoist is to be purchased: speed, or the number of feet of hand chain that must be overhauled to raise the load a given distance; and force, or the pull in pounds required on the hand chain to raise the weight. As ordinarily made, the number of feet of hand chain that must be overhauled to lift a given load is about the same with the pulley block and high-speed hoist. And as the differential pulley block is the cheaper hoist, it evidently is to the question of force, or the effort exerted on the hand chain, to which one must look to establish the superiority of high-speed hoists.

What are the facts? With a one-half ton high-speed hoist, a pull of 60 lb. only must be exerted as against a pull of 120 lb. with the differential pulley block; with the one-ton high-speed hoist, a pull of 80 lb. only must be exerted as against a pull of 218 lb. with the differential block; and with the two-ton high-speed hoist, a pull of 120 lb. is exerted as against 306 lb. with the pulley block. Thus, it is evident, the problem reduces to one of labor versus price. From two to three times as much effort must be exerted to lift a load with the differential pulley block as with the high-speed hoist.

In practically all cases, and specially in the oil fields, the high-speed hoist is by far the cheapest to use because it prevents unnecessary waste of human effort, the most expensive of any kind of power that it is possible to buy.

The screw hoist is of the worm-and-gear-wheel type and is designed to be used for work where the hoist has to be continually shifted about as in general repair work. It is more efficient than the differential pulley block but only about one half as efficient as the high-speed hoist. With this hoist the pull on the hand chain is cut down at the expense of speed. For example, with a one-ton screw hoist, 60 ft. of chain must be overhauled to raise the load one foot, whereas with the high-speed hoist only 30 ft. need be overhauled to do the same thing. With both hoists, however, the force applied is about the same.

The Manistee Iron Works Co., Manistee, Mich., manufacturers of Roturbo centrifugal pumps, vacuum pumps, rotary jet condensers, and evaporating equipments for salt, sugar, and potash, have opened a Pacific Coast office in the Rialto Building, San Francisco, which will be in charge of L. M. Page, general sales manager for this company for the last five years. The company expects to open branches also at Los Angeles, Cal., Portland, Ore., and Seattle, Wash., which also will be under the supervision of Mr. Page.

TRADE CATALOGS

Hoists—The Allis-Chalmers Manufacturing Co., Chicago, Ill., has issued a new bulletin, No. 1803-A, dealing with the company's line of Corliss steam hoists for mines.

Heaters, Evaporators—Ross Heater & Manufacturing Co., Inc., Buffalo, N. Y., has issued its catalog F, illustrating and describing the various types of heaters, condensers, expansion joints, coolers and "airjector" pumps made by it. The line includes an oil cooler for cooling lubricating oils and quenching oils before reuse.

Ladles—Whiting Corporation Harvey, Ill., (formerly the Whiting Foundry Equipment Co.) has issued catalog No. 156, superseding number 147, of December, 1920. The new catalog, of thirty-one pages, is well illustrated, and specially presents the maker's new-style helical worm geared crane ladle. There is also a new style "teapot spout" ladle having the spout inside the bowl. A copy will be mailed on request.

Cars—The Lake Shore Engine Works, Marquette, Mich., has issued an illustrated pamphlet, entitled "Marquette Cars," which outlines some of the equipment that is manufactured by that company for mining and other industrial use. Several types of cars are featured in the bulletin, but there is also included such equipment as rotary car dumpers, mine cages and skips, crossheads and sheaves.

Locomotive Cranes — The Brown Hoisting Machinery Co., Cleveland, Ohio, has issued its 88-page catalog "K 1921," dealing with its line of locomotive cranes. The 160-odd large photographs eloquently describe the variety of forms and of uses of these cranes, and indicate the extensive patronage enjoyed at home and abroad. Tables and skeleton drawings aid the prospective purchaser to select just the type and size suited to his need.

Cottrell Processes—The Western Precipitation Co. of Los Angeles, Cal., has issued an attractive folder simply describing the various applications of the Cottrell method of electrical precipitation of suspended particles from gases, and giving a selected bibliography on the subject. Many illustrations and diagrams are shown which make clear the method of installation.

Pipe Stocks and Dies—The Armstrong Manufacturing Co., Bridgeport, Conn., has issued catalog No. 16, illustrating and listing the company's full line of genuine Armstrong stocks and dies. The pamphlet calls special attention to the new machines for threading and cutting off pipe. All are built with standard care, the larger sizes having all driving gears inclosed in an oil chamber.